THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. OCTOBER 13. 1898. CHICAGO, ILL. NUMBER 41

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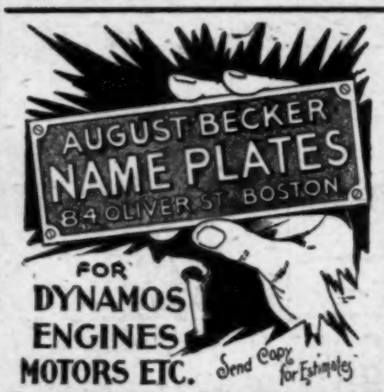

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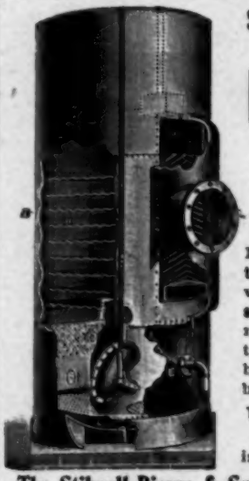

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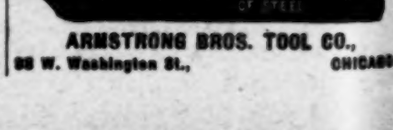

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. OCTOBER 13, 1898. CHICAGO, ILL. NUMBER 41

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

It is still possible to find good reasons for further advances in iron and steel products, but manufacturers do not show any strong faith in a general uplift. Steel rails may be put on a higher basis, just as structural material is now held at a profitable level; and Southern iron, by reason of liberal exports and the heavy sales at home may go another notch higher. But taking the market in its length and breadth, the fact that so little impression has been made on values by the enormous business now so fully occupying mills and furnaces that are fit, is taken as an index of the narrow limits within which fluctuations will take place. That the export movement enters more and more into the plans of steel manufacturers is seen in the capture of 25,000 tons of plates for the Coolgardie riveted pipe contract by Pittsburg. Not only is this a signal victory for an American mill, but it means that meantime domestic business will overflow into mills that must have more money for their product, and that for the next year the plate mill capacity of the country may not be equal to demands upon it. The important development of the week in pig iron is the move of the Bessemer association of valley furnacemen for the establishment of a single agency for the sale of their iron. The $10 price at furnace has been withdrawn pending the conclusion of arrangements, and it is understood that quotations will not be made six and eight months ahead, as has been done recently. Prices will be subject to change, on the theory that certainty about prices retards buying, while uncertainty is a stimulant. It is expected that the new arrangement will give a better outlet for furnaces that have been unable to make sales under the present regime, from not having the connections enjoyed by others for three-cornered deals, in which billets taken for pig iron are disposed of to finishing mills and the price covered. Some export inquiry for Bessemer pig iron is reported. Pittsburg reports, also, that price has been asked on a large lot of coke for export. The Southern pig iron situation has reached a point at which furnaces are unable to get cars enough for shipments, and the chances are that the stringency will be worse before it is better, owing to the cotton movement. Connellsville coke producers are suffering, also, from car shortage, and the closing weeks of the lake trade will only aggravate the conditions in the lower lake district. Southern soft irons are more difficult to get and all grades are very firm. Northern foundry furnaces are getting business, diverted from the South, but at practically the prices of the past two months. Gray forge is a shade lower. The billet market has eased a trifle and $15.85 to $16, Pittsburg maker's mill, is the basis, with little new demand. The spread of close to $6 between Bessemer and steel billets maintained recently, reflects the over-supply of Bessemer iron and apparently a temporary inadequacy of billet-making capacity. But for the Bessemer furnacemen's agreement the disparity would have been more pronounced The steadiness of demand in all finished lines is the feature of the trade most remarked by mills and selling agencies. Railroad orders, barring rails, are abundant beyond anything in recent years. Until the rail mills come to a decision on the proposition to advance the price, the rail situation is all uncertainty. Business is expected after the New York meeting of Nov. 1.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World*, }
801 TRADESMEN'S BUILDING, Oct. 12. }

The general market is unchanged, the slight fluctuations that have occurred in some directions being met by greater firmness in other lines. The influx of foreign inquiries continues unabated and promises good business in the near future. A considerable inquiry for coke is reported to have been received from abroad recently, and one for a lot of Bessemer pig iron.

PIG IRON.—The plan of the valley furnacemen to establish a central selling agency for their product is the talk of the local buyers and sellers. The committee of the association was in Pittsburg this week arranging details. The success of the plan is largely dependent upon bringing all the furnaces in and also upon the man or firm appointed, as the agent's discretions will not be small. Outside iron is still offered but demand is slack as most buyers are full. Bessemer iron can still be had from $9.85 to $9.90 while the pool price is withdrawn. The price here is from $10.45 to $10.55 delivered, the freight being cut 15 cents. Gray forge has weakened a little, being now quoted from $9.35 to $9.45. Foundry irons are in fair demand but always in small lots, the buyers taking as they need. No. 2 is quoted from $10.15 to $10 25, with most of the sales at the latter price. Prices are as follows:

Bessemer, valley furnace	$ 9.90	to	10.00
Bessemer, Pittsburg	10.45	to	10.55
No. 1 Foundry	10.55	to	10.65
No. 2 Foundry	10.15	to	10.25
No. 3 Foundry	9.65	to	9.85
Gray Forge, valley furnace	9.00	to	9.10
Gray Forge, Pittsburg	9.35	to	9.45

BILLETS AND RODS.—The continued quietness of steel has caused a slight drop in prices, although no fear is felt of any great weakness developing, as it would be inconsistent with general conditions. The quotation is from $15.85 to $16, at maker's mill with one sale of 2,500 tons reported at the latter price. Sheet bars are again firm at their old quotation of $17.50 to $17.75. They are still very scarce and deliveries both from Pittsburg and Wheeling district mills are scarcely up to contract pace. Rods are not available for prompt delivery orders, the mills being reported oversold. The quotation is $22 maker's mill. One local firm is figuring on an inquiry from Japan and another from Manchester, Eng.

IRON AND STEEL SKELP.—The rush of the pipe and tube mills keeps skelp in steady demand and the mills are crowded with orders for months ahead. Prices are firm as follows: Grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.22½c to 1.25c; grooved steel skelp, 1.22½c to 1.25c; grooved steel skelp, 1.02½c to 1.05c; sheared steel skelp, 1.10c to 1.12½c.

PIPE AND TUBES.—The much talked of order for the Coolgardie, Australia, pipe line has been heard from but yet there is nothing in it for this country, as 246 miles of riveted pipe have been contracted for by Mephan Ferguson, of Melbourne, Australia, and Hoskins Brothers, of Sydney, have been awarded the contract for the 82 miles of welded pipe. Several good orders at home are occupying local attention. The mills

are still full to overflowing and the buyers continue to call loud and long for their stuff. The additional discounts of six tens for less and six tens and two and a half per cent off list for car load lots are still quoted. Base discounts are: Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 47½ per cent off; lap weld, galvanized, 52½ per cent off. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off. Inserted joint casing is now quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off.

SHEETS.—Business has quieted down somewhat but the condition is still good and no great falling off is looked for. Galvanized are in better demand than black sheets. The quotation on galvanized is 80 and 7½ to 80 and 10 per cent off list with usual freight allowance. Black sheets are quoted on the basis of No. 28 at 1.95c.

STRUCTURAL MATERIAL.—The question of the addition to the State house at Columbus, having worked its way into court, it will be some time before the contract for structural work is awarded. A large tonnage of bridge shapes has been placed by the West Side Traction Co. for its bridge over the Monongahela river. Prices are very firm for all material and are as follows: Beams and channels, 3 to 15 inches, 1.20c; 18 to 24 inches, 1.30c; tees, 1.25c; zees, 1.20c and angles 1.10c. Universal plates alone at 1.15c; with other shapes 1.05c.

PLATES.—Business continues excellent, and now that the Coolgardie order is started, it is likely to be augmented by Pittsburg contracts for the plates. Railroad orders are coming in excellently, one firm receiving between 20 and 30 orders from railroads alone on Monday. Prices are as follows: Tank, 1.15c; shell, 1.20c; flange, 1.25c; fire box, 2c and upwards.

FERRO-MANGANESE.—The quotation is $50 for 80 per cent domestic delivered.

RAILS AND TRACK MATERIALS.—Conditions are unchanged from a week ago, business in both light and heavy sections being excellent, with the former a scarce article. The conference of rail makers is still without result. Quotations are $19 to $19.50 for light sections and $18 for standard rails. Track materials are quoted as follows: Spikes, 1.50c; track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins have been quoted as high as 1.27½c. but the nominal market is 1.120c.

SPELTER.—The quotation is the same as last week's but is firmer at 4.85c to 4.90c.

SPIEGEL.—The market is very quiet at $23.50 to $24.

OLD MATERIAL.—The demand continues slow. Old iron rails are scarcer every week and when found command good prices. One sale of 2,000 tons at $13.85 is noted. Another sale noted was of 1,500 tons steel rails at $10. Other materials are as follows: Wrought scrap, $11.30; cast borings, $6; busheling scrap, $9.25, net; car wheels, $10.25, gross; cast scrap, $9; iron axles, $6, net; steel axles $12.50, gross; charcoal scrap, $10, gross; billet and bloom ends, $11; machinery scrap, $9; wrought turnings, $6.75, net.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, Oct. 12.

There has been a moderate increase in the demand for pig iron, and a good sale for all kinds of finished iron and steel in the week. Mills and furnaces still find it more difficult to keep up with old orders than to secure new business. Consumers are taking their material as fast as it can be made and shipped to them. The rail market is still unsettled, as nothing has been decided by the rail makers as yet, and it is not likely anything can be done until the next meeting in New York, Nov. 1.

PIG IRON.—The market was a little more active last week than the week previous. The demand was somewhat larger, and sales were more frequent, although no very large orders were closed. Dealers are looking for a considerable increase in their business within a short time, and it seems quite likely that their hopes will be realized. The foundries in this district are almost all running full, and are taking their iron as fast as the furnaces can get it out. The sales of the past two months or more have been far from heavy, and it is more than likely that many concerns using pig metal have about used up their last orders and may be expected to come into the market shortly. The situation is stronger now than for some time past. The local furnaces are full of orders, and will not consider business offered at less than the quoted prices. Southern producers are getting into line, and are not making as low prices as they were two and three weeks ago. The smaller concerns in the South have followed the lead of the larger ones, and are asking more money for their products, but the three larger producers are still above the smaller ones 25 cents, and are asking the top prices we quote for their irons. It seems to be the fact, too, that they are able to get these prices in many instances while iron can be procured from other concerns at lower quotations. We revise our quotations as follows:

Lake Sup. Charcoal	$11 50 @ $13 00	Southern Coke No. 3	$10 35 @ 10 60
Local Coke Fdy. No. 1	11 50 @ 12 00	Southern No. 1 Soft	10 85 @ 11 10
Local Coke Fdy. No. 2	11 00 @ 11 50	Southern No. 2 Soft	10 60 @ 10 85
Local Coke Fdy. No. 3	10 75 @ 11 00	Southern Silveries	11 25 @ 11 50
Local Scotch Fdy. No. 1	11 50 @ 12 00	Jackson Co. Silveries	12 50 @ 14 50
Local Scotch Fdy. No. 2	11 00 @ 11 50	Ohio Strong Softeners	12 00 @ 12 50
Local Scotch Fdy. No. 3	10 75 @ 11 00	Alabama Car Wheel	15 00 @ 16 00
Southern Coke No. 1	10 85 @ 11 10	Malleable Bessemer	11 50 @ 12 00
Southern Coke No. 2	10 60 @ 10 85	Coke Bessemer	11 50 @ 12 00

BARS.—There has been considerable business placed in the last week, most of it in small lots, although several good sized contracts for car iron have been given out. The market is unchanged in values. Common iron is quoted at 1.05c to 1.10c; guaranteed at 1.10c to 1.20c; soft steel bars from strictly billet stock, 1.15c to 1.20c.

RAILS AND TRACK SUPPLIES.—No business has been closed in this market in the past week, as the mills await the decision of the meeting at New York, Nov. 1, before making sales. Rails are still quoted at $20, Chicago. Other quotations are as follows: Steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—A few small sales of rods have been made by mills farther East, but no sales of billets are reported. The local mill is not taking business at present, having a full order book. Prices are unchanged at $17 for billets and $22.50 for rods.

CAR ORDERS.—The Pennsylvania is understood to have placed orders for several thousand cars within the past ten days. No other large contracts have been given out, but several smaller orders were placed last week. Car material is in large demand, and several good sized orders have been placed in the week.

PLATES.—There has been a good demand for plates, and several good sized orders were placed last week. There are a good many inquiries in the market which will be closed within a week or two. Quotations are made as follows: Tank plates, 1.20c to 1.30c; flange steel, 1.30c to 1.40c; firebox steel, 1.85c to 5c.

STRUCTURAL MATERIAL.—Pittsburg closed a contract for the material for a 1,000-ton building in Boston last week, through the Chicago contractor who secured the job. No other large contracts were placed, but general trade was excellent—larger than in the week previous—and specifications on contracts are very heavy. No changes have been made in quotations, which are as follows: Beams, 15-inch and under, 1.35c to 1.40c; 18-inch and over, 1.45c to 1.50c; angles, 1.25c to 1.30c; plates, 1.20c to 1.30c; tees, 1.40c to 1.45c; zees, 1.35c to 1.40c. Small lots from stock are quoted at ¼c to ⅜c higher.

SHEETS.—Both black and galvanized sheets are in excellent demand, and the sales of last week were slightly in excess of those for the week previous. Included in the business placed were several good sized orders. The market is firm at 2.10c to 2.15c for black and 80 and 5 per cent discount for galvanized.

MERCHANT STEEL.—The mills do not appear at all anxious for business, but on the contrary are turning down orders every day that are the least exacting in specifications or shipping requirements. Nearly all mills are full of business for some time ahead, and cannot take orders for anything like prompt shipments. Consequently sales were somewhat restricted last week, although there was a good demand, which continues. Quotations follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Some fairly good sales of old iron rails and old steel rails were made last week, most of them for delivery

at other points. The demand for some grades of scrap is slightly improved, but others are still quiet. Dealer's selling prices are as follows:

Old iron rails, gross,	$12 50@$12 75	Axles, net	$14 25@$14 75
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 25@ 4 50
Old steel rails, short	8 75@ 9 00	Wrought turnings, net	6 00@ 6 50
Old wheels, gross	11 00@ 11 50	Axle turnings, net	7 00@ 7 25
Railroad forge, net	11 50@ 12 00	Mixed steel, gross,	7 25@ 7 50
Dealer's forge, net	10 00@ 10 50	Stove plates, net	5 75@ 6 00
No. 1 mill, net	7 50@ 8 00	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	8 50@ 9 00	Old iron splice b., net.	12 75@ 13 00
Malleable cast, net	8 00@ 8 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Oct. 12.

Exact figures received by the iron ore sales agents confirm the authoritative opinion recently quoted in this report, that September shipments would be less than those of September, 1897. The total was 1,851,752 tons from all upper lake ports, or 244,000 tons less than for September of last year. The aggregate to Oct. 1 was 10,994,201 tons, as against 9,807,571 tons to Oct. 1, 1897. The gain over 1897 shipments which was 1,430,000 tons on Sept. 1, has been reduced to 1,186,000 tons. If October and November shipments should be just equal to those of last year, the year's total, by water, would be somewhat less than 13,500,000 tons. As has been explained heretofore, the shortage of labor on all ranges has brought the output considerably below earlier estimates. Freight rates are 80 cents from the head of Lake Superior, 65 cents nominally from Marquette, no tonnage being sought, and 65 cents paid from Escanaba. The scarcity of non-Bessemer ores is being emphasized as the season is drawing to a close. Ten cents advance is paid over earlier purchases but even at $2 the amount of non-Bessemer hematites to be had is exceedingly small. All ores of this class have been sold at the lowest price on record, this year, and with the demand that has developed it would seem that the situation is ripe for including these properties in an agreement next year.

PIG IRON.—The proposition to establish a single selling agency for the Bessemer pig iron produced in the valleys, referred to in this report several weeks ago, is about in shape to be carried out. A well known Pittsburg dealer is expected to exercise this function, and as an important step to the new arrangement the $10 furnace price on Bessemer iron has been withdrawn. For the present furnaces are not quoting. It is common experience that while the element of uncertainty in the pig iron market stimulates buying, a price fixed months ahead, while it insures a stable market, throws all the burden of carrying stocks on the producer—the buyer is apt to defer purchases until the iron must be had. While upwards of 280,000 tons of Bessemer iron has been sold by valley furnaces for delivery before June 1, 1899, and unsold stocks are decreasing, there is every expectation that a Pittsburg selling agency, and prices fluctuating with little or no notice, will tend to increase sales and improve conditions from the producer's standpoint. Recently some sales have been reported indicating that the price was being covered up in exchanges. Bessemer pig has been sold on the $10 basis, in exchange for billets at an agreed price and the latter have been taken by a third party to the deal—a merchant mill. Freights have been subject to manipulation, 50 cents from the valleys to Pittsburg and 55 cents to Wheeling having been done instead of 65 and 70 cents respectively. The Wheeling district has been a buyer of metal lately and some Pittsburg business has been done at $9.90 to $10 furnace, or $10.40 to $10.50, Pittsburg The foundry iron market is steady, $9.50 to $9.75 being the range on No. 2 iron. Gray forge is sold at $8.85 to $8.90 at furnace and the market is a trifle easier. Lake Superior charcoal is active and it is evident that stocks carried at receiving ports will be less than usual the coming winter. We quote f. o. b. Cleveland.

Bessemer	10 40@10 55	Valley Scotch No. 1	$10 40@10 55
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 15@10 40
No. 2 Strong Foundry	10 15@10 25	Gray Forge	9 50
No. 3 Foundry	9 65@ 9 90	Lake Superior Charcoal	11 50

FINISHED MATERIAL.—The feature of current business with mills and jobbers is the steady volume of orders and their wide distribution. Large contracts are not frequent, but the aggregate is beyond anything experienced since 1895, with no sign of cessation. Pittsburg plate mills are refusing business, one being filled far into next year. Yet prices on plates have not been advanced by other sellers above a 1.15c basis Pittsburg, and Cleveland deliveries are available at 1.20c. The local mill has the plates for both the vessels to be built by the Cleveland Shipbuilding Co. and another shipyard will probably be in the market for 2,500 to 3,000 tons of plates in the next few weeks. Steel bars are held at 1c Pittsburg by some mills; yet the price is shaded 50c a ton by others, and the valley quotation is 97½c at mill. Bar iron in the valley is held at 95c to 97½c. Sheets are fairly active and prices are maintained. We quote 2c to 2.05c Cleveland for No. 27 in car lots. The Home telephone building will now be pushed. About 1,000 tons of steel will be needed. Some agricultural works purchases are pending, amounting to about 1,500 tons of plates, bars, etc. In wire products the market is strong and the agreed prices are generally held. We quote smooth wire at $1.17½, Cleveland, and wire nails at $1.42½ in single carload lots, Cleveland.

CINCINNATI.

Oct. 11.

The feature of the Southern iron market, so far as consumers are concerned, is the inability of the furnaces to ship on old contracts. In the first place there is a shortage of iron, particularly in foundry grades. This situation is further complicated by a scarcity of cars, so that when the furnaces have the iron they are not able to get it away. One furnace company in Birmingham sent in one day last week a requisition for 150 cars more than could be supplied. It is impossible to tell when the car situation will be improved. As yet cotton has not moved in any great quantity, and when it does begin to move many more cars will be needed than are called for at present. Very little buying is being done and full prices are being obtained. The scarcity of Southern soft grades is more pronounced, and many consumers are obliged to change their mixture in consequence, adopting Northern softeners and silveries instead. Some of the Southern furnaces are entirely out of the market on No. 1 soft and No. 2 soft for delivery, this year, and others decline to make quotation for delivery beyond 1898. It is said that in some cases furnaces in need of repairs are kept going because they cannot be spared. Many manufacturers who contracted late in the spring and early summer for all the pig iron they expected to require through remainder of the year have placed additional orders, and some have entered their second supplemental order. Charcoal irons continue to enjoy a liberal share of the current foundry business. We quote for cash f. o. b. Cincinnati: Southern coke No. 1 foundry, $10 to $10.25; No. 2, $9.75 to $10; No. 3, $9.25 to $9.50; No. 4 and gray forge, $8.75 to $9; mottled, $8.75 to $9; No. 1 soft, $10 to $10.25; No. 2, soft, $9.75 to $10; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Jackson Co., silvery, No. 1, $12 to $12.50; standard Georgia car wheel, $14.25 to $15.

Hoop and Cotton Tie Agreement Dissolved.

At a meeting held in Pittsburg, Oct. 5, the manufacturers of hoops and cotton ties who have maintained a measure of agreement on prices in the past three years decided to dissolve the association. The firms included were: J. Painter & Sons, Wm. Clarke & Sons, Lindsay, McCutcheon & Co., Singer, Nimick & Co., of Pittsburg; Union Iron & Steel Co., of Youngstown, O., and A. R. Whitney, & Co., Duncansville, Pa., with headquarters in New York. The Cleveland Rolling Mill Co., of Cleveland, has not been a party to the agreement at any time. It is reported that some low prices have been made recently and it is agreed that the cost line has been reached for some of the mills.

A RECEIVER was appointed Oct. 7 for the John T. Noye Mfg. Co., of Buffalo, well known manufacturers of milling machinery. The firms embarrassment results from impairment of credit, in view of extensions made by creditors in 1893. Mortgage indebtedness is $100,000; unsecured indebtedness, $80,000. Assets are $36,000 in accounts, $88,000 in machinery and stock on hand, and $150,000 in land and buildings.

A PRESS dispatch reports that the Bellaire Steel Co. has discontinued the use of natural gas and has started its own coal mines to supply the requirements of its steel plant.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

OCTOBER 13, 1898.

THE QUESTION OF ORE SUPPLY.

In spite of the tremendous volume of business in every department of the iron trade, there has probably never been a time when its future has been questioned with more interest, not to say anxiety. True, there is great unanimity in the belief that consumption on home and foreign account will make record breaking years for production, in the fag end of the century. But the question which disturbs the individual producer is how far he will be a contributor to these large outputs, and how he shall put his house in order, not for leaving but for continuing in the business to which he has devoted a life-time. Concentration has gone on very recently and is still going on, at a rate that makes every man in the business think hard on the outcome. These movements, moreover, have been most conspicuous at the foundation of the trade. Future ore supply, in sufficient quantity and at cost low enough to give security to the enormous investments in furnaces and steel works at Pittsburg and Chicago, has been the aim of the master strokes of the past year or two.

Other furnace and steel works companies have done a deal of thinking, as they have viewed these preparations for the great campaign that is admittedly ahead, both in home and in foreign markets. Iron mining companies with no furnace connections have also found a situation to think about. With 6,500,000 tons a year of the best Lake Superior ores taken up by two great companies, and the destination of enough more to make 9,000,000 tons determined in advance by mining connections of furnaces and steel works, outside consumers find reason to stir themselves. It is a matter of some moment to concerns with investments of millions in blast furnaces and mills to know that they will have an adequate supply of such ores as their mixtures demand and at prices that put them on a footing with competitors. The price proposition is far less important, for reasons which have been frequently gone over since the original Oliver purchase on the Mesabi, than that of supply. The independent Bessemer interests on the old ranges, capable of producing upward of 200,000 tons of ore a year can be counted on the fingers of a single hand. And when five years have passed over the Lake Superior region and 70,000,000 tons more of the best ores in the world have been taken from its mines, what standing will the buyer of ores in the general market have?

On the other hand is the desire of the independent ore producer—who now has no market for his ore, except as he finds it from year to year—to make sure of the destination of his product, in view of the recent lessening in the number of his customers. The situation, it would appear, is ripe for further deals involving ore mines on the one side and furnaces and steel works on the other. Negotiations, in some cases, are in progress. Whether the method be by corporate union, purchase of mines, or an agreement for a supply of ore over a term of years, the important fact is that a recasting of the lines on which the ore business has been conducted for years will be an early development.

STARTING IDLE ROLLING MILLS.

At Zanesville, O., the home of the Ohio Iron Co., whose rolling mill and blast furnace are in the hands of a receiver, a citizens' meeting was held recently, to devise ways and means for the starting up of the long idle mill. In Indiana, similarly, there is agitation of a proposition to start the fires in a rolling mill plant, representing an investment of hundreds of thousands, that went on the idle list in the depression following the crash of 1893. A similar effort was made in a Northern Ohio city some months ago to raise money for the rehabilitation of a rolling mill company, once a factor of consequence in the merchant iron trade. It had gone to pieces after years of heroic borrowing, always stimulated by the hope that the steadily ebbing tide of prices would flow in again and touch the old-time marks. The capitalists who had loaned the concern more than it was worth, were able to see, as the situation was canvassed, that the old days would never come again, and the mill found its way to the scrap piles.

It is surprising, in view of the drift of events in the past two years, especially—and teeming newspaper columns have told in no doubtful way, how "monopoly" has marked the iron industry for its own—to note the considerations urged for the investment of new money in the Zanesville plant. The meeting referred to was told that "there could be no doubt of putting the mill on a paying basis if the right steps were taken to secure an energetic and progressive management, with sufficient working capital." History was recounted, showing that in 1860 and later the mill was running full and paying good dividends, reaching more than once 60 and even 80 per cent; that since the management of the original owners ceased there had been no fixed policy, and thus disaster had come. It was urged that mills are now running overtime and have more orders than they can fill; that capital is seeking investment in iron manufacture, and that if only citizens would lend their influence to secure outside

capital, the plant could be restored to its old activity and revenue-yielding status, and resume its monthly distribution of over $20,000 in wages.

Local public spirit is commendable, and the desire to restore an industry that has dropped for a time out of the ranks is natural; but if the stimulators of enthusiasm in such schemes are wise, they will go deeper than the generalities about crowded mills, general prosperity in the iron trade, and the desirability of large monthly pay rolls. Rolling mills of the class that are in receivers' hands cannot live, saying nothing of prospering, under the prices of to-day. To start them up is simply trying to turn back the hands of the clock. By the time another Directory of the iron and steel works of the country is issued they will be put on the abandoned list by the consent of those who now refuse so to label them. The truth is not palatable, but the fact remains. And the only proper advice to those now trying to get them under way, is *Punch's* advice to those about to marry.

PROTECTIVE EFFORT IN THE BOILER TRADE.

The American Boiler Manufacturers' Association had before its St. Louis convention last week the question of questions in all similar organizations. What protection can the association give its members against price cutting and the competition of irresponsible makers? That, in substance, is the inquiry of manufacturers invited to become members. Demoralization of prices is the prime, persistent evil, and its cure should be, in the opinion of many, the first object of associated effort. President Hartley said in the discussion on this point that many boiler manufacturers solicited to join, had promised to do so just as soon as improvement in prices and full protection against destructive competition could be assured.

The same question has confronted the foundrymen's associations from the beginning. Formed for the purpose of finding the way to improved practice and of bringing the trade to higher ground through a general educational movement, they have failed to enlist the co-operation of a large contingent which sees no inducement to membership apart from the definite, practical trade benefit to be had from price agreements and defense against unreasonable demands by labor organizations. The boiler makers' association is like the National organization of the foundrymen in having accomplished not a little for the advancement of the industry it represents. At the Philadelphia meeting in 1897, specifications for boiler steel, after discussions running through several conventions, were finally formulated. And at St Louis last week the results of papers and discussions in previous years, and a year of work in committee, were crystallized in the boiler specifications, printed elsewhere, representing the consensus of the best thought and practice in the trade.

A mistake is made, we believe, by those who consider all concerted effort useless unless directed to securing uniform prices and wages. The history of many movements in these directions does not bear out the claims so confidently made for them. It may be said for the associations that aim at improved practice that they lead to a confidence and mutual respect among the members, the absence of which would be fatal to any attempt to agree on schedules intended to be observed. In the case of the foundry trade, the American Foundrymen's Association, the organization for the discussion of technical and practical questions, made possible the National Founders' Association, which seeks to fill the other field. The latter might have been possible without the former. but we question if a dozen years of effort directly aimed at organization for defense would have accomplished what grew naturally out of two years' conventions of representative foundrymen, at which acquaintances were made, common interests discovered and confidence established.

The indirect method is sometimes the shortest. Secretary Meier in his statement at St. Louis of the results achieved by the associated boiler manufacturers, showed the great value of even a partial co-operative movement. And he might have added that while the members were doing zealous work in establishing standards for the plate mills and tube mills, in getting uniform inspection laws and in agreeing on specifications for boiler work, they were doing more than could be accomplished in any other way to prepare the trade for the protective regime. The difficulties of the problem are fully indicated in the fact that in the nine years of its career, the association has had some form of protective agreement constantly before it as its goal. To have launched an association for the avowed purpose of preventing demoralization and correcting trade abuses would have been to invite certain defeat, as long as jealousy and distrust were everywhere present. And one defeat would have disposed of the movement for a generation. Now the way has been paved, so that the larger work can be undertaken with some show of success, if ever any success can come to an attempt to correct the abuses from which boiler manufacturers are conspicuous sufferers.

The Federal Steel Co.

Monday, Oct. 10, was the day on which cash payments on Federal Steel Co. stock were due. It is stated that 98 per cent of the stock of constituent companies was deposited with the trust companies. What remains now is to elect officers and arrange a multitude of details connected with the starting of so great a corporation. It is expected that the organization will be completed this week, officers of the various companies being now in New York.

In connection with the Wall Street phases of the new aggregation, figures are being given by those in the inner circles, forecasting the probable financial return. The fixed charges are $660,000 on Illinois Steel Co. bonds, $370,000 on Elgin, Joliet & Eastern bonds and $397,100 on Duluth & Iron Range bonds. Total, $1,427,100. Dividends on $52,000,000 preferred stock at 6 per cent are $3,120,000. The net annual income after taxes is put at $6,000,000. This figures out a surplus of $1,452,900 for common stock. It is estimated that a strong campaign on the stock exchange is in the minds of those prominent in the new company.

THE Cleveland wire mill strikers in their answer in court, to the petition of the American Steel & Wire Co. for an injunction to prevent the strikers interfering with workmen or the operation of the works, affirm that the company is a trust, does not pay living wages and should have no standing in court.

CHAMPION POWER HAMMER.

Beaudry & Co., of Boston, have sought to adapt their Champion power hammer to light and heavy railroad, machine and general forging. Twelve sizes are made, the weight of the ram ranging from 30 to 500 lbs. Special study has been given to the mechanism for giving the necessary elasticity, this being secured by the travel of the ram upon spring arms, operating in a concaved track. The device, which is simple and direct acting, allows the ram great freedom of throw and causes it to rebound the instant the blow is struck. Control of the force of the blow is in the hands of the operator, who regulates it by pressure on the foot treadle. There is no reaction or jump of the ram. Very light power is required.

There is no beam, saddle, rubber cushion, coil spring, nor any form of spring and link connections of wearing parts. The ram or head is of steel and the shape of its internal curved track is shown by dotted lines in the illustration. The two spring arms, with rolls at their lower extremities, operate within the ram upon this curved track and serve to lift and throw the ram which with increased speed of the hammer acquires increased travel and force of blow. The box pillar frame is rigid, occupying small floor space, and requiring a foundation of moderate size. The anvil is an independent casting having no connection to the frame, thus preventing crystallization of the hammer parts. The crank shaft, of large diameter, runs in a hard bronze bushing chambered for oil. The crank pin is adjustable for varying lengths of stroke. The connecting rod runs on a bronze sleeve. The connecting rod, spring box and ram are steel castings. The spring arms are forged from Swedish steel and have hardend tool steel rolls. The tension on the spring arms is adjusted by two tension nuts in the spring box.

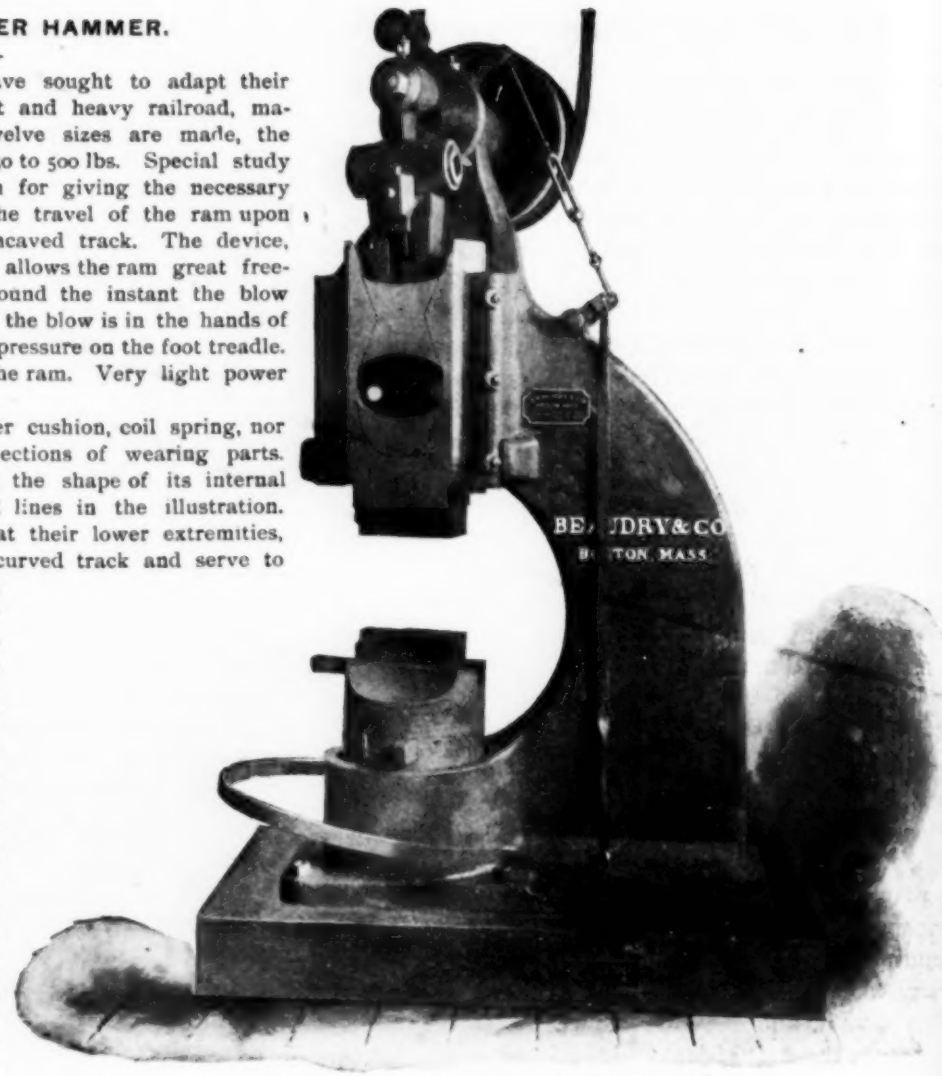

FIG. 1.—BEAUDRY CHAMPION POWER HAMMER.

The heavy ram guides are cast solid with the frame, and have an adjustable brass gib and a positive oiling device. The ram is adjustable for varying heights above the dies; the full stroke can be had on a piece four inches square as readily as on a piece one-half inch in thickness and no change of adjustment is required, except for unusually heavy or special work. The anvil has an independent adjustable shoe die. Full length bars can be worked either way of the dies. The ram is counterbalanced by weight in the pulley. The positive brake will stop the hammer almost instantly and will hold the ram at any desired position of its stroke. The hammer is direct-acting, it can be made to run at the will of the operator at a high speed and to deliver blows from one pound to its full capacity.

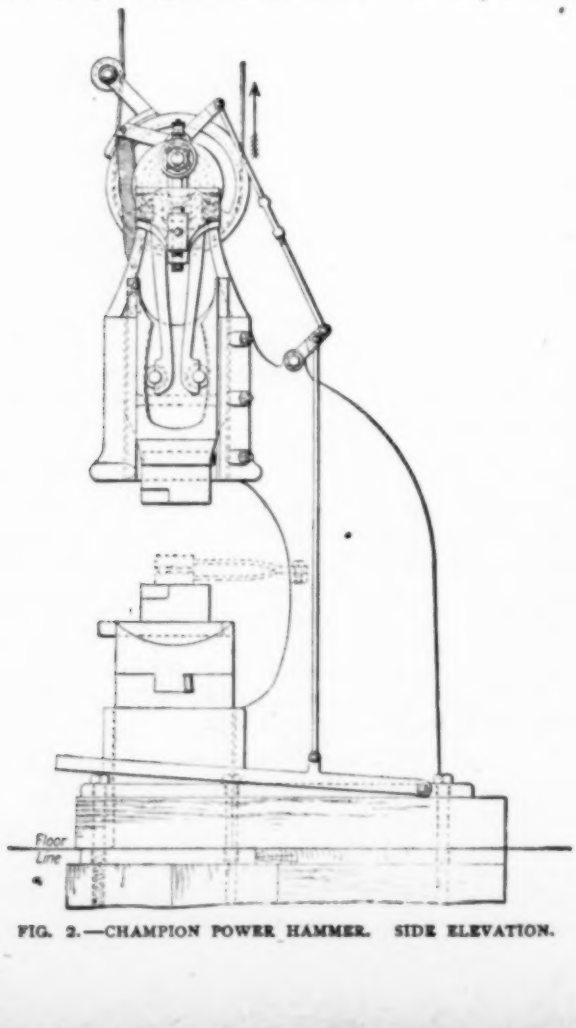

FIG. 2.—CHAMPION POWER HAMMER. SIDE ELEVATION.

Lake Shipyards and Atlantic Coast Contracts.

A report in circulation on the Atlantic Coast, to the effect that the Newport News Ship Building & Dry Dock Co. has refused to book any additional orders for merchant vessels is, if true, highly significant. That the rumor, if not literally correct, is at least indicative of the general conditions existing at the Newport News yard would seem to be proved by the failure of the firm to bid upon the torpedo boats and destroyers for which contracts were recently awarded, taken in conjunction with the fact that in addition to the five merchant vessels and three battleships building by the Newport News Co., there has just been awarded to it the contract for one of the coast defense monitors. In another part of the *Review* a prominent Eastern vessel owner is quoted as saying that a new vessel which he will build will entail an outlay 20 per cent in excess of that which would have been necessary had the contract been awarded several months ago. These and other constantly recurring evidences indicate that there was nothing of exaggeration in the predictions which have been made of a wonderful activity in ship building, and it is incidentally worthy of note that several of the more prominent lake ship builders anticipate securing some contracts from the Atlantic Coast, in view of the crowded condition of the yards there.—[Marine Review.

BUFFING AND POLISHING LATHE.

The Webster & Perks Tool Co., of Springfield, O., is building a new buffing and polishing lathe, which has several features of interest. The design and construction of the machine, as shown in the illustration, and the fact that it weighs 400 pounds, will convey some idea of the stiff and substantial construction it embodies. The diameter of the spindle is 1¼ inches by 14¼ inches length of bearings. The arrangement is such that this lathe may conveniently be driven from either above or below, the latter way being the more desirable, as in

FIG. 1.—BUFFING AND POLISHING LATHE.

operation the work being applied to the under side of wheels, the tendency is to lift up, which is equalized to an extent by this method of belting. It is provided with a pair of tightly fitting dust and lint proof covers, and the belt and pulleys are also thus securely enclosed, excluding dust and loose particles from rag wheels, and preventing them from being carried by means of the belt to the floor below.

The machine we illustrate has tight and loose pulleys on the center of the spindle, the latter being fitted with a bronze

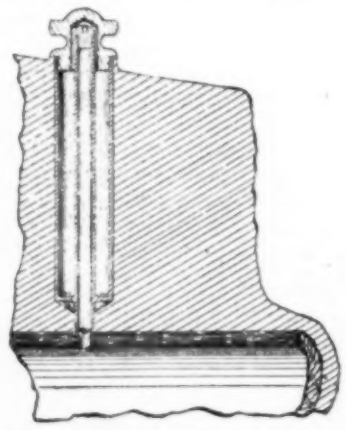

FIG. 2.—AUTOMATIC OIL DEVICE.

bushing having an oil recess holding a sufficient quantity of oil to run several days without refilling. There is also provided a sliding shifter within easy reach of either operator, as shown. In addition, it is further provided with dust proof and self-oiling bearings, a sectional view of which is given. This device is similar to a trap, and provides for the deposition of any foreign matter that may be admitted with the oil to the oil cup. The latter is entirely removable for examination or cleansing. As will be observed, the stem of this oil cup screws into the hole on the top of the journal, the large outer tube fitting in the hole in the casting. In this cup are two holes at about one-third of its height, and the oil is contained in the space around the central tube, and passes through the small holes just mentioned to the inside of the tube, and on to bearings. The space around the inner tube is the oil reservoir, and that portion of it below the holes receives the settlings of fine emery or other foreign matter. The plug with the screw driver slot is soldered in the top of the tube, and is used for screwing the oil cup into place or removing it. The large cap on the outside of the head is removable by hand, which gives access to the oil chamber, when necessary to replenish with oil.

THE MACHINERY TRADE.

Further Opinions on the Situation and the Outlook.

Answering your recent inquiry: Our present experience is that the machinery trade in our production is not increasing to any remarkable extent. The volume of business with us in the present year is ahead of last year up to date; yet there are no encouraging signs of marked improvement in any particular direction with us.

The export business of the present year is most responsible for our increased sales over last year to this time. It has of late, however, shown no increase. We are inclined to believe that foreign manufacturers are making strenuous efforts to supply their home demand with a reproduction of American machines, in many cases copied very closely. We are not preparing for any expansion of our foreign machine trade at present, believing that such demand has reached its height, insofar as American machinery is concerned. We are looking for increased activity in the domestic trade.

DIAMOND MACHINE CO.

Providence, Conn.

Replying to your questions, we answer them as follows:

1. The machinery trade of the United States would have been in a terribly demoralized condition had it not been for our foreign trade during the past five years, and a great many of our manufacturers who have been extending their business in the past year or two are sending from three-quarters to nine-tenths of their product abroad, and nearly all of the machine tool manufacturers have been sending at least one-half of their output to foreign countries. This shows that the home trade has been extremely light.

2. This export business continues to grow, and while most of the trade at first was in the line of bicycle machinery, the trade to-day is largely for the heavier classes of machine tools. We think the business will continue to be very large for another year or two. Foreign copies of American machinery injure us but very little, as most of these copies have been made from old style machines. Consequently the foreign customers prefer to buy the more recent designs of American manufacturers. The increasing growth of the home trade must interfere quite seriously with the export business, as our manufacturers will be unable to supply the demands and we shall lose orders on account of time of delivery.

3. With the present volume of foreign business and the prospect of a very great increase in home trade, our manufacturing facilities in the line of machine tools will be inadequate to supply the demand. The prices are already advancing on this account, and the factories will have to be very much enlarged to take care of the increase in business. We think the war that we have just passed through is going to help American manufacturers very materially, as it will increase the reputation which we already have in foreign countries.

HILL, CLARKE & Co.

Boston, Mass.

S. H. WADDELL, trustee, is reported to have conveyed to H. C. Frick 300 acres of land near Eat Chicago, Ind. This is a part of the land deal at this place, to which reference was made some months ago. There are no plans for the erection of plants at present, as reported in dispatches.

W. S. ROCKWELL & Co., of New York, report the demand for their improved oil furnaces to be steadily increasing. They have booked orders for over 25 furnaces for various classes of work in the last two months.

FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held on Wednesday evening, Oct. 5, at the Manufacturers' Club, Philadelphia, with President Wanner in the chair. An innovation in the sessions of the association was a magic lantern which had been set up in the rear of the room to throw views of various sorts upon a screen over the president's chair.

Secretary Evans presented the report of the executive committee, which referred to the purchase of a magic lantern and stated that should any member desire to present before the association a view of new machinery or other object of interest, the committee would be glad to make a slide from a photograph so that it could be thrown upon the screen.

The treasurer reported a balance in the treasury of $1,600.

The nomination of officers was begun and Mr. P. D. Wanner was renominated for president, despite his protest. Then, on motion of Mr. Devlin, all the old officers were renamed and the nominations closed.

Mr. John Birkinbine, who is a member of the association, and president of the Franklin Institute, made a suggestion that was received with interest. He said: "I have just come from a meeting of the committee on science and arts of the Franklin Institute. This committee considers all inventions brought to the notice of the Institute, and upon its verdict the Institute presents certain medals and awards of merit. Suppose the Foundrymen's Association should provide each year a medal for the most meritorious casting or for general progress in any department of the foundry trade during the year. Does it not seem that such a procedure would bring good results to the Foundrymen's Association, whereby it may perpetuate itself and arouse interest? This association might combine with the Franklin Institute to make such award." The matter, after comment by several members, was referred to the executive committee.

George C. Davis, of Thomas Devlin & Co., read a paper on "The Early History of Malleable Cast Iron in the United States." It was accompanied by a half-dozen lantern slide views illustrating operations at the old plant of Seth Boyden, at Newark, N. J. The paper appears elsewhere.

Following the reading of the paper, W. G. Morris, of Newark, N. J., was introduced by Mr. Devlin, as one of the men to whom Mr. Davis had been indebted for his data. Mr. Morris said: "I assisted Mr. Davis in acquiring some of the information contained in his paper, and I can, therefore, corroborate a great deal of it. There is one point, however, to which I must take exception. I contend that the only 'shoving furnace' that was ever successful, to my knowledge, is the one we are using now. We have used ours for 50 years, and it is still good. I have worked at malleable iron for 48 years. When I began they used four buckles on a gate for a pattern, where now 60 or 70 are used. I was acquainted with Boyden, and my father worked with him. There is another statement I would like to make, and some of you may disagree with me, but I can't help that. I want to say that I do not think Mr. Boyden ever got any benefit from the wrought iron which he put in his cupola or crucible. I believe it all burned away and went up the stack."

Mr. Flagg: "Can old malleable iron be melted?"

Mr. Morris: "I don't believe it. I went to Chicago to open Crane's shop there. I used old malleable iron there in conjunction with Scotch, and found a loss of 25 to 30 per cent, which was only attributable to the malleable iron, and certainly not to the Scotch. It made the castings very pourous."

Mr. Davis: "Was English or American brick used in your time?"

Mr. Morris: "We had no English brick within my memory. I recall," said Mr. Morris, "that there was a stationary furnace built in Elizabethport before Boyden started his. In the old days 1,000 was the highest heat attempted."

Mr. Devlin then said: "As Mr. Davis has told you, it was at my suggestion that his paper was written. I had noticed that all the old-time workers in malleable iron were dying one by one, and I thought it would be worth while to gather some of their reminiscences of the old days while there was yet time. Accordingly, Mr. Davis and I went to Newark recently, and called upon Mr. Morris. He, in turn, presented us to Obadiah Boyden and others, and we gathered much curious information. It was too much to put into a single paper, and so it was decided to publish it in pamphlet form. These pamphlets will be ready soon, and any member who wants one can have it."

A vote of thanks was given to Mr. Davis, and the meeting then adjourned.

Startlingly sudden was the death of Mr. W. G. Morris, who, as noted above, participated in the discussion on Mr. Davis's paper. Mr. Morris left the meeting, in company with Mr. Devlin, to go to his hotel. At Juniper and Market sts. he fell to the ground unconscious. It was found at the Jefferson Hospital, to which he was speedily removed, that he had died on the way. Mr. Morris was well known among the iron founders of the East. He was 62 years old and had been engaged in foundry work for 48 years. He was senior member of the firm of Morris & Barlow, of Newark, N. J.

No. 1 blast furnace of the Aetna Standard Iron & Steel Co., at Mingo Junction, O., was put in blast Oct. 4. No. 2 furnace is being relined and new stoves and new additional blowing engines built, so that on the completion of this work the stacks, which have been operated alternately heretofore, will be in blast together.

THE Illinois Steel Co. will soon add an electric plant at South Chicago. The building will be 50x135 feet, and it is expected that $200,000 will be spent in equipment and construction.

THE Shenango Valley Steel Co., New Castle, Pa., is starting up its new sheet bar and tin plate bar mill, on which work has been in progress since last year.

THE Clinton Iron & Steel Co., of Pittsburg, has its plant for the manufacture of cement from blast furnace slag about ready for operation.

THE Ohio Steel Co., Youngstown, O., now has all the plans completed for the rail mill it has purposed for some time to build. Construction work will begin at once and will be pushed to early completion.

THE Cleveland Shipbuilding Co. has two steel steamers to build during the coming winter. Both are to be big cargo carriers of the 6,000-gross ton type. One is for Capt. Thomas Wilson, of Cleveland, and the other, according to persistent rumor, is for Mr. A. B. Wolvin and others of Duluth, but the Cleveland Shipbuilding Co. says that the second boat is on its own account thus far.

EDWARD R. LADEW and Joseph H. Ladew, who have for years comprised the firm of Fayerweather & Ladew, 159-165 East Houston st., New York, together with John J. Hetzel, long their general manager, have formed a corporation under the laws of New York State, to be known as Fayerweather & Ladew, Inc. The incorporated concern, following the old firm, with its 60 years of prestige and success, will be the sole maker of Hoyt oak-tanned short-lap belting, in addition to other brands.

AUGUST BECKER, of 84 Oliver st., Boston, notes an improvement in the machinery trade, as indicated by the inquiries coming to him for name plates, these being from a considerable number of firms in different lines.

PRINTED on wooden paper and enclosed in a wooden envelope, the latest reminder of the Gobeille Pattern Co. calls attention to the fact that some iron and steel firms persist in working in wood and contrasts its facilities for pattern work. Recently in getting out patterns for war material this company had 50 skilled workmen on a single order.

THE Standard Brass Works, Kalamazoo, Mich., issue a special catalogue describing their tubular well supplies, giving prominence to brass cylinders and well valves.

THE EARLY HISTORY OF MALLEABLE CAST IRON IN THE UNITED STATES.*

BY GEO. C. DAVIS.

Little has been written of the history of malleable cast iron; and so far as I am aware, no account has ever been published of the beginning of this industry in the United States. This is my excuse for presenting to you an account of what I believe to be the first malleable iron foundry in this country. The word malleable is often used, especially by English writers, to distinguish soft iron such as is produced by the puddling process and which is usually classed in this country under the general term wrought iron. By malleable cast iron—or malleable iron, as it is commonly called—is here meant a casting made from pig low in silicon, sulphur and phosphorus and from which the carbon has been partly removed by annealing in ferric oxide or other porous or infusible substances, the carbon which remains in the iron being present mainly as graphitic temper carbon. I will endeavor to describe the practice in earlier times, the difficulties encountered and will briefly mention some of the earlier foundries.

Seth Boyden, the Pioneer in Malleable Work.

The first malleable iron castings of domestic manufacture were produced in Newark, N. J., in 1826. Seth Boyden, to whom belongs the honor of doing this, was a native of Foxboro, Mass., but settled in Newark in 1815, when in his 27th year. As a boy he worked at farming and occasionally at a furnace operated by one of his uncles. He attended school for only a few short terms; but this by no means ended his education, for he continued his studies by himself, especially in those natural sciences which would aid him in his labors. He showed to a very marked degree the traits of the stock from which he sprang. Mechanical ingenuity and skill with tools came to him naturally. He was, in the course of his long life, occupied with many of the arts and sciences and so great were the benefits conferred by his many inventions and improvements on existing processes that the citizens of Newark have erected a statue in his honor. Much of the apparatus with which his experiments were conducted was made by his own hands. He made among other things a telescope, microscope and electrical apparatus and engraved a label for his books. Such work as this was usually done at odd intervals, or after the regular work of the day was over and was to him rather recreation than serious business, but it served to show his versatility. Many claims have been made for him as being the inventor of various processes. His original inventions were numerous; but his best, and certainly from a commercial standpoint the most important, work was done in perfecting the ideas of others. There are few inventions which are not in dispute, and it is often the case that after learned men have written articles proving to their satisfaction their own side of the case, the archaeologists step in and state that the Chinese or ancient Egyptians knew all about the article in question several thousand years B. C.

Boyden is credited with inventing a machine for making wrought iron nails, a machine for making brads and files, a machine for cutting and heading tacks and a machine for splitting leather. He also made the first patent or glazed leather, as it was then called, produced in this country and carried on quite a business in this article for some years in supplying harness makers. He built locomotives and made many improvements in their design. In this connection it is interesting to note that he built a locomotive called the "Cometa" for the Cardenas railway of Cuba, and went there himself in 1841 to put the engine in operation. One of his most important inventions was a machine for forming hat bodies, which he patented. In later years, when old age had incapacitated him from active business, he turned his attention to raising new and improved varieties of strawberries, and succeeded in this as in other things. It was characteristic of the man that a problem once thoroughly mastered, he turned his attention to some new process. He seemed to care only for mechanical success; any profits he might derive from his labor being merely useful to enable him to experiment in some other line. It seems incredible that he should have accomplished so much, but his life during the three score years in which he was actively engaged is a good illustration of the endurance and persistence of the hardy New England stock. He took little care to protect his own interests and died a poor man in the year 1870.

Soon after Boyden settled in Newark he was engaged in the silver plating business and it is possible that this was indirectly the cause of turning his attention to malleable iron. A large part of his business was in plating carriage and harness hardware. In those days, such articles were necessarily quite expensive, as they were made by hand from wrought iron. It is evident from Boyden's notes that he had learned that such articles could be cast and rendered malleable by annealing; but he evidently knew nothing of the details of the process. Gen. Runyon, in his address at the dedication of Boyden's monument, said: "What is called malleable iron was known before Mr. Boyden discovered it, but he invented it as truly as ever a man invented anything wholly new and previously unknown." This view has been held by many; but I believe it to be clearly in error, for in experiment No. 6 of Boyden's notes, he says: "A piece of English m. iron was in, but no important alteration." Again, under date of Aug. 4, 1826, we find this entry: "50 lbs. sprew, 50 lbs. pig, white; when baked a perfect resemblance of some English of the same size." Thus it appears that at about the time Boyden began his experiments, he had in his possession some malleable castings that had been made in England.

Progress in Malleable Work Abroad.

Let us turn for a moment to note the progress of this industry in other countries. Reaumur had published the fundamental principles of the process in the year 1722 and some years later patents were granted in England for softening castings by annealing in ashes. This process applied to such castings as nails, anchors, cannons, chains, forge hammers, etc. In 1804, Sam Lucas, of Sheffield, took out a patent on malleable iron, but he believed the difficulties to be insuperable and so made no use of his patent on a commercial scale, at least. His brother, Thos. Lucas, shortly after took up the matter and suceeded in producing cast cutlery which, according to Parks ("Essay on Edge Tools," 1815), would take as fine a polish as the best cast steel. These articles were sold under the name of "run steel." According to Percy and other authorities the use of malleable castings rapidly extended and by 1830 the industry had attained large proportions. The castings were used for cutlery, pulley blocks, carriage and harness hardware and a variety of other purposes. Thus we see that malleable iron had been manufactured in England for some years before Boyden began his experiments.

Mr. Boyden's Experiments.

In 1828, the Franklin Institute of this city offered a silver medal for the best specimen of annealed cast iron to consist of not less than one dozen pieces. The report of the committee of that society says: "Premium No. 4 for the best specimen of annealed cast iron is awarded to Seth Boyden, of Newark, N. J., for specimen No. 163, being an assortment of buckles, bits and other castings, remarkable for their smoothness and malleability. This is the first attempt in this country to anneal cast iron for general purposes that has come under the knowledge of your committee, and the success attending it fully entitles the maker to a silver medal." From the wording of this report it is evident that the committee were aware of the manufacture of malleable castings abroad, and in awarding the medal to Boyden it was merely for excellence of workmanship on a novel article. There is no hint in the wording of the report of the process being regarded as an invention of Boyden's, prior or otherwise.

His experiments with malleable iron of which we have record extended over a period of six years. At first they were carried out in his house, the iron melted in a crucible in a forge fire and the castings annealed in a small furnace, erected in his fire place and using hard coal. In this way he made a series of 12 experiments to determine the best pig iron to use, the best packing, proper temperature for annealing, etc.

Irons Used in Early Foundries.

He was evidently sufficiently encouraged by the results

* Read at the meeting of the Foundrymen's Association, Philadelphia, Pa., Oct. 5, 1898.

obtained to erect a foundry, which was started in the summer of 1826, for on July 4, of that year, is the first entry under the leading experiment in the foundry. His observations and deductions were exceedingly shrewd, though his explanations were often at fault. When we consider how little was then known of chemistry and metallurgy, this is not surprising. The selection of a suitable pig iron occasioned him little difficulty, though he tried many brands separately and in various mixtures. He mentions Peru, Carthage, Bennington, Vt., three brands of Salisbury—R. B. & Co., H. C. & Co., and C. S. Co.—two brands of Egg Harbor—Etna and Weymouth—Sheldon, Washington, Amenia and Scotch. This latter was soon given up; the notes on experiments Nos. 10 and 11 stating that it was brittle. The reasons for this we can well imagine.

Few of the brands here mentioned are familiar to the foundrymen of to-day. Etna and Weymouth recall to us the industries which once existed in the Jersey pines. Of these once flourishing concerns, scarcely a trace remains. Weymouth Furnace was located on Great Egg Harbor River, about six miles from May's Landing. It was erected in 1802 and has long since been abandoned. Etna Furnace was situated on a tributary of the south branch of Rancocas Creek, two and a half miles from Medford and four miles from Taunton, in Burlington County (Swank's "Iron in All Ages.)" The Salisbury Furnaces are probably the only ones now on the active list. The companies referred to, viz.: Richardson, Barnum & Co., Canfield, Sterling & Co., and Holley & Coffing all operated plants in Litchfield, Co., Conn. The works owned by the last named firm were located at Chapinville and here was built the first blast furnace in Connecticut. This was about 1762, at which date Ethan Allen was one of the owners of the property. Holley & Coffing also operated a furnace at Mt. Riga, which was most probably the one from which Boyden obtained his iron. This furnace began operation about 1810, and was abandoned in 1856. Amenia Furnace was located in Dutchess Co., N. Y., 24 miles east of Poughkeepsie, and not in Connecticut, as Boyden states in his notes. This furnace began operations about 1770. Iron from the Salisbury district was hauled by teams to Hudson or Poughkeepsie, and thence transported by water. So far as can be learned iron was not sold on commission, at least in the early days. The dealings were direct between producer and consumer and payments were made in cash or more frequently on long time notes. The Sterling Iron Works were located in Orange Co., N. Y. This iron was considered for many years one of the best brands for malleable castings and was in use for this purpose as late as 1861. The Long mine, from which Boyden obtains some of the ore for packing, was located on this property. Peru and Carthage furnaces are supposed to have been located near the towns of the same names in New York State.

Boyden tried various additions to the molten iron, such as sulphur, phosphorus, tin, zinc, lead, antimony, and nickel, but soon gave them up, as the effects were either injurious or negative. In the last entry, Sept. 1, 1832, there is a brief reference to melting on a basic lined furnace, which reads: "The more iron, if free from carbon, the stronger heat is required to anneal it; lime on bottom in place of sand iron equally good." Boyden evidently believed that pig iron melted in an air furnace lost most of its carbon. When the silicon had fallen so low that the castings came white, the carbon being in a combined state, he evidently thought the carbon had been removed.

In annealing, serious difficulties confronted him. He succeeded in producing well annealed castings, remarking Oct. 20, 1826: "I have a piece so good it will not harden any more than copper and when hammered is scarcely inferior to the best wrought iron." He soon determined the proper temperature for annealing, as at a number of places in his notes he writes of keeping the pots at the temperature to melt silver—954 degrees C. At intervals during the night, when it was necessary to add fuel, he used a primitive alarm to awaken him. This was done by placing a candle on a nail so that when the candle was burnt down to the nail the rest would fall on a piece of metal and thus awaken the sleeper. His notes bear records of many failures and we can scarcely realise the work entailed by the numerous experiments, especially with various types of pots and methods of packing. The small furnaces, in which the experimental work in annealing was done, must have required frequent attention. Concerning this part of the process, he seemed to be to a greater extent groping in the dark. For packing he tried various kinds of native iron ore, Spanish brown hematite, manganese ore, sand, clay, lime, ashes, hammer scale and various mixtures of them. At first large amounts of saltpeter were used, but this caused soft scale and he soon learned to use less. Other substances, such as alum, salammoniac, pearlash, and plaster of Paris, were used, as he says, "to strengthen the packing." Thus on May 1, 1827, we find the entry "packed in oxide of iron, 1 32 saltpeter, 1-32 alum, and ⅛ lime added; casting covered with a thick scale, though it was perfectly air tight." It acted like sulphur or plaster of Paris, which shows that a packing composed of two different materials will destroy the iron when either of them would answer well alone. Boyden also tried other experiments in packing, such as sand and alkali white, which were failures. He writes under the date of April 3, 1827: "The conclusion is that red oxide of iron is important and in fact the best thing known for packing and Sterling well refined, the best iron." Of the other difficulties he encountered the two worst were "black porous," and "crystallizing." As to the causes of these we can only surmise. Boyden himself soon learned to remedy the former trouble by remelting with a small amount of wrought iron, thus lowering the silicon and preventing the formation of graphitic carbon, which may have been the cause of the trouble. He attributed crystallizing to silex (silica), and said, April 3, 1827: "By a number of experiments and observations it is evident that crystallizing proceeds from silex in some way. Pig iron made from ore containing much silex, or silex getting into the iron when melting or annealing, the iron will be brittle and pourous."

The crystallizing may have been caused by insufficient time and temperature in annealing or by high sulphur in the casting, resulting from remelting and large additions of sprew, thus rendering annealing difficult. The iron annealing pots wore out so fast that he tried various ways to prevent it, such as brick pots coated with lead and clay and lined with sheet iron; earthen pots surrounding the iron ones; iron pots packed in ore and small iron pots inside larger ones. The reference, Nov. 22, 1828, to the established size of the main pots evidently refers to these outer pots. In some cases reannealing remedied his troubles, as owing to his practice of using earthen pots which are poor conductors of heat, the inside of the charge probably was not hot enough at the first trial. One interesting experiment from a chemical point of view, is given under the date of April 21, 1831, where the author says: "One pot filled with work, but no packing; the steam of alcohol conveyed in during the heat; work was not quite as good as the other way, covered with soft black scale. A piece of casting annealed as above was rather brittle and crystallized; was again heated two hours in hydrogen gas and was changed to tough piece free from crystals and in every sense good." These experiments were evidently of no practial value, but it would be interesting to know how they were made with the crude apparatus at his disposal.

Features of Early Practice.

Passing now to the consideration of the commercial features and works practiced during the first few years, we find that the foundry which Boyden erected was located at 28 Orange st., in the rear of his home on Bridge st. It gave employment to about 60 molders. At first, and for much of the experimental work, the iron was melted in a crucible heated with charcoal or hard coal. Lime was the flux most frequently used, but experiments were also made with other substances, such as iron ore, sand, clay, glass, and sulphur, with this end in view, evidently with the idea of leaving nothing untried. Some of these were obviously forlorn hopes, as in experiment No. 9, we find the entry: "Delaware, ½w, pounded fine with glass, brittle as usual." Boyden's practice seems to have been to run the iron very "high," and he speaks in a number of places of the iron being "sparkling" and "smoky." The latter term presumably indicates incipient oxidation and a very high temperature. Considering these facts, it is somewhat remarkable that no mention is made of shringkage, which does not seem to have troubled the early founders at all. An air furnace was soon built

with a capacity of 1,000 lbs. Fuel was dry pine wood or soft coal and it is said that eight heats a day were made, starting at 3 A. M. and often not finishing until late in the evening. This furnace was not tapped, the iron being dipped out in clay washed ladles holding from 10 to 12 lbs. each. In the notes June 12, 1828, there is a reference to Virginia coal. This coal probably came from the mines in Chesterfield County, near Richmond. Nicholas, in his book "The Story of American Coal," says: "In 1750, Virginia bituminous mines were opened and worked on the James River near Richmond; these mines were opened for the market in the United States. Owned by an English company and competing only with English coal, they enjoyed for some time the exclusive coastwise trade of the Union. In their nature the coals are very dry and gaseous." These mines are not now worked, but were in operation as late as 1842. So-called patent fuel (coal and rosin), came into use in 1831—March 25. Rosin at this time was very cheap,—75c to $1 a barrel, and so continued up to the civil war, when it rose rapidly in price, reaching at one time, it is said, $68 a barrel, and coal tar was used instead.

The first cupola was built in 1832 and used hard coal. This cupola was of the solid bottom type, and consisted of a straight shaft, the upper part of which could be lifted off so as to allow cleaning and repairs after a heat. The pig and fuel was charged in at the top or at the door near the top. Surrounding the shaft was a large bell shaped draught stack. An archway through this stack afforded entrance to the charging platform; there being ample room between shaft and stack for the men to work. Such a cupola as this could be operated only every other day, as the cinder and unmelted stock required time to cool, so that it could be dug out and repairs made to the lining. The use of cupolas and air furnaces for melting malleable iron was up to a comparatively recent date peculiar to this country; it being still the practice in many foreign works to use crucibles.

Molding sand was obtained from a place between Newark and Elizabeth. For cores, sand from Rockway, L. I., was used, the binding material being wheat or rye flour. The patterns were usually made from white metal, though iron, brass or wooden patterns were sometimes used. Fewer pieces were molded on the gate than is now the practice, as it was thought impossible to run them. For 1-inch buckles from four to eight were placed on one gate, though several gates were molded in one flask. The flasks were made of sheet iron, circular in shape and were fastened together with a button and eyelet hole. The castings were cleaned in a tumbler which was made from a keg strengthened with iron hooks. A door was cut in the side and holes bored to let out the sand. Iron journals were bolted on the ends. The journal boxes were of wood, and power was furnished by a belt over the center of the keg.

First Annealing Furnace.

The first annealing furnace was shaped like a bee-hive and the pots were inserted from the top which could be removed by a crane. Mill scale was packed around the pots and the whole kept at an annealing heat for a week. This type was succeeded by a rectangular furnace which was run continuously. The floor was laid on an incline and the charging done from the higher end. The whole charge was moved along and pots were thus pushed out at the lower end, hence the name "shoving furnace." This furnace was closed by large bungs luted at the joints and held 48 pots, which were about 12x10x10 inches. They had a solid bottom and after packing were covered with an over-lapping tile inverted and the joints luted. The fire boxes were on the side with inlet ports near the top of the furnace, thence the flame went to the upper end and then down to the flues that led underneath to a stack near the lower end. Pine wood, charcoal or soft coal were used for fuel. The castings were cleaned by tumbling with leather and stars. A considerable variety of castings were made, comprising, as stated in the catalogue, a small card, size 3x4 inches, printed on one side, which is here shown, over a thousand different articles. Among the articles enumerated are "cavasons for the Spanish market." Judging from this, Boyden was as fully alive to the advantages of a foreign trade as are some of our modern imperialists. It may be necessary to explain that a cavason was a ring with a staple cast on it, which is put on the nose of a horse in order to wrench it so as to facilitate breaking in. The demand for castings was mainly local, and at first they met with the usual opposition. The blacksmiths objected to the variable character of the metal and feared it would do away with much of their trade. The prices obtained at first were about 25c per lb., but they gradually fell to 8c by 1854 and afterwards rose somewhat during the war.

Other Pioneer Malleable Plants.

In the early 30's, Otis Boyden, a brother of Seth, had started the Crockett foundry, in Newark. This was burned down in 1835, in which year the Boston M. C. I. & S. Co. bought out what was left of the Crockett foundry equipment and also Seth Boyden's establishment, continuing in business until 1837, when they failed. Thus Seth Boyden's connection with the malleable iron business ended in 1835, after continuing nine years, though as we shall see later, several of his brothers started other foundries. The Boston company was succeeded by a stock company, which from time to time underwent various changes in membership, until at the present day the place is operated by Mr. W. G. Morris under the firm name of Morris & Barlow. Part of the original building still stands serving as the wall of the present foundry, though it has been raised several feet.

The extension of the malleable iron industry was very rapid, and several foundries were started in various places at about the same time. Many of the concerns were short lived as they suffered from the financial troubles of '37, and the difficulties encountered by any new process. It is impossible in the time at my disposal to do more than briefly refer to some of the others. There were two concerns in Elizabethport, of which I have been unable to learn very much, except that they were probably started previous to 1840. David Meeker began making malleable iron in Heddenburg's works in Newark in the year 1841, but removed two years later to his present location, where the business is now conducted by S. J. Meeker. The N. J. Malleable Iron Works was started in 1848 on the spot where the Market St. Station of the Pennsylvania Railroad now stands. At one time there was said to be eight malleable iron foundries in Newark.

In Massachusetts, the malleable iron business was first established in East Boston about 1835, by a company incorporated with a capital of $100,000, and under the management of Alex. Boyden, a brother of Seth's. A younger brother Frank was also employed there. This concern only ran about two years, as there was not much demand at that time for machinery castings of malleable iron. The company made stock goods, such as hammers, axes, chisels, etc.; very little light cored work being attempted. They evidently followed along the lines of the earlier English works, as large quantities of castings were made under the impression that they were steel, which could not be sold and as no dividends were forthcoming, the stock was bought up by a few persons who crowded out the Boydens. So far as can be learned, the practice in these works differed in no essential from that already described. Flat bar Salisbury pig was used and the melting was done in two air furnaces, capacity 1,000 lbs. and 1,600 llbs., respectively, the latter being considered a large a furnace at the time. A cupola was erected but for some reason did not succeed. It is said that the packing was oxidized with sea water.

In 1837, Alex. Boyden was employed by Frederick Fuller, of Easton, Mass., who at that time was operating the Easton iron foundry established in 1752, to start a malleable iron foundry in Easton, certain land and buildings being leased to Boyden for $350 per year. This paper begins according to old legal form: "This indenture, made the first day of March, 1837, by and between Fredk. Fuller of Easton, in the County of Bristol, gentlemen, on the one part, and Alex. Boyden of Easton, in the County of Bristol, iron founder, on the other part, witnesseth, etc." Evidently in those days the distinction between an iron founder and a gentleman was sharply drawn. The foundry was continued under Boyden's management about a year when his interest was bought out by Lincoln Drake, who was the executor of the Leach estate, owners of the Easton foundry and who had been Fuller's financial backer. Boyden agreed not to establish or help establish any other malleable iron foundry in New England.

In 1838, Daniel Belcher took charge, buying out the business 10 years later and continuing it until his death, which occurred in 1890. At these works about one-quarter flat bar Salisbury and three-quarters Sterling iron was used, which was valued in the inventory taken 1840, at $50 per ton. Flat bar was the common name for Salisbury iron at that time, but from which of the furnaces it came or whether it was common to all of them, I have been unable to learn.

A Manufacturer's Experience.

I am indebted to Mr. George C. Belcher, the present proprietor of these works for many of the interesting details of the early practice and feel that I can do no better than give the account in his own words. He says: "The molders made their own cores, dumped and trimmed their own castings and helped the melter when skimming the slag from the air furnace, for all of which they received $1.25 per day. The fuel used in the air furnace was Pictou coal, costing $14 per chaldron—36 bushels—and pine limb (trash wood). The charge was 800 lbs., sometimes 1,000; and the writer well remembers when the melter without consulting the "boss" had the temerity to put in 1,500 lbs. with what anxiety all watched the furnace for something to happen, expecting the bridge to give way and let the iron back on to the grates or that the whole business would puddle and refuse to run when tapped. The bottom of the air furnace was made up of quartz mixed with a little clay and stood about 16 heats The quartz was obtained in the neighborhood and was first calcined in the air furnace and was then pounded up. Stourbridge fire brick were in common use at this time in the construction of the furnaces. The annealing furnaces were also run with Pictou coal and pine wood, the firemen firing up every 15 minutes. The annealing pots were pushed in on rolls at one end of the furnace and pushed out when done at the other end by the introduction of fresh pots. Very soon after he took charge. Mr. Belcher built a hard coal annealing furnace which while building was ridiculed by all old hands, including the melter who was from Newark, but proving successful, was afterwards claimed by the melter as his own invention. The castings made at first were carriage, harness and stove trimmings, fliers for cotton speeders and fly frames, pump castings, mule fingers, loom forks, keys, axle nuts, and shanks for garden trowels. Pipe fittings were manufactured here as early as 1849, and possibly earlier. They were shipped to Walworth & Nason, of New York City, to have the threads cut. The prices obtained for axle nuts in 1840 was 12½c per lb; stove trimmings, 15c per lb. Average price of castings including cored work, 16⅔c per lb or ⅙ shilling. Large speeder fliers, however, brought 50c per lb. In looking over the old patterns some years ago, I found that many of them were finished and gated in a superior manner. Match plates similar to those now used in machine molding were employed with good success and molds were made rapidly. The flasks were made of cherry wood and the workmanship on them was of the best. I am indebted to Mr. Horace Spaulding, of Easton, for much of my information. Mr. Spaulding, who is now 83 years of age, was a molder in the East Boston foundry, and is the only person now living who was concerned with the malleable iron works when first started. He relates that in the early days of the business, Alex. Boyden used to have a little pump or syringe with which he used to squirt something into the air furnace stack and also used to drop some kind of metal, probably zinc, into the molten iron creating a smoke, all of which was to make a mystery of the process in the minds of the workmen."

One of the first malleable iron foundries in the Central West was established in Cincinnati, O., previous to 1850, and possibly as early as 1845, by Miles Greenwood and Thomas R. Wood, under the firm name of M. Greenwood & Co. So far as can be learned, the works practice was similar to that already described. Missouri surface ore pig was considered essential and commanded an extra price on that account. The iron was melted in a cupola and later an air furnace was erected.

In closing, the writer wishes to acknowledge his indebtedness to Messrs. O. S. Boyden and W. G. Morris, of Newark, N. J.; Milton H. Robbins, of Lakeville, Conn.; Geo. C. Belcher and Horace Spaulding, of Easton, Mass.; James L. Haven, of Cincinnati, and Thomas Devlin, of Philadelphia, at whose suggestion this paper was undertaken.

Review of the Technical Press.

[Translation, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

The Emancipation of the Molder. [*American Machinist*, Sept. 29th.]—An able editorial brings up the constantly recurring agitation to improve the status of the founder so far as doing away with manual labor is concerned. This is proper, for here is a great field but little exploited though gradually opening. The tendency of the modern foundry to specialize, and the consequent close competition in many of the resulting lines, will be a potent factor in advancing the idea, here again suggested, that not the skill of the molder or mechanic should be replaced by machinery, but his muscle. There is cited the familiar example of breaking pigs by hand instead of the cheaper mechanical means. The lifting of the charges by hand or wheelbarrow to the cupola platform might be added as another. It is truly stated that foundrymen have not yet gotten to think of machinery for their work, as is the case in manufacturing industries. A traveling crane in the foundry is something like a milling machine in the machine shop—once there, they are never idle. Conveyors for various purposes certainly deserve more attention than they now receive. The whole subject can be summed up in this manner: Given a series of operations now done by hand. How many of them can be carried out with the aid of machinery kept in operation a sufficiently long portion of the day to pay a fair dividend on the investment? It takes a keen head and an extended knowledge and experience to do the right thing in the right place. This holds good in the foundry just as much as in any other enterprise.

Strength of Pulley Arms. [*American Machinist*, Sept. 22nd.]—Prof. C. H. Benjamin contributes an interesting paper describing a series of experiments with pulley arms. This is in line of what we require in our daily practice, for even with a given quality of iron the resulting castings sometimes show characteristics quite different from those expected. Two classes of pulleys were tried, the plain cast iron and the steel rim. The latter were ground true and the former had their rims left as cast. To obtain actual conditions as nearly as possible, the pulleys were mounted above the testing machine, a steel band was thrown over the rim and fastened to the cross head in a suitable manner, arranging things so that the relative pull on either side of the pulley could be adjusted as desired. For the experiments this ratio of pull between the two sides of the strap was two to one. This ratio moreover gives a larger crushing force on the pulley in proportion to the torque applied. In the case of cast iron pulleys, test bars of the same size and shape as those of the pulley arms were cast from the same ladle of iron. They were mounted on 12-inch supports and broken transversely. The modulus of rupture of the arms of the cast iron pulleys was 35,830, and of the supposedly cast steel arms of the steel rim pulleys was 50,800. The practical results are very interesting. The pulleys are subjected to a gradually applied load and deflections noted. In every instance the arm nearest the tight side of the belt bent most and finally broke, usually at the hub. In the steel rim pulley all the arms broke at the hub. A separation after fracture was noticed in the cast iron pulleys, showing the presence of severe casting strains. The results incidentally show that the design of the cast iron pulley is practically correct. A discussion of the theory of pulley arms is now given and some useful points on pulley design deduced. The general conclusions derived from these experiments are "that the bending moments in the pulley arms are not evenly distributed by the rim but are greatest on the arm near the tight side of the belt. That there are bending moments at both ends of the arms, the greater being at the hub, and the ratio depending upon the relative stiffness of rim and arms," and that a wider rim will help the arms materially.

Warming the Blast for Furnaces, [*Zeitschrift des Vereins Deutscher Ingenieure*, Sept. 10th.]—Mr. F. Braune contributes an illustrated article on this subject. German fuel conditions deal solely with coke; anthracite and charcoal being out of question for blast furnace purposes. The use of the coke is threefold, the reduction of the ore, the carburiza-

tion of the iron, and the development of the heat required during the whole of the process. The reduction of the oxides is effected either by carbon directly, or indirectly by cyanogen, which is produced by the union of carbon and nitrogen. Whichever reaction takes place the fact remains that less air is introduced into the blast furnace than is required theoretically to burn carbon to carbonic acid. The total amount of coal required for the reduction and carburization of a given burden will always be constant; no saving can be effected herein. In regard to the portion required for heating the charges, however, in doing which the bulk of the fuel is consumed, a very distinct saving can be brought about. Considerable controversy has existed regarding the reaction of the blast with the fuel, whether the carbon is burned to carbonic oxide at once or to carbonic acid which afterwards takes up more carbon, forming carbonic oxide further on. All evidence points to the correctness of the latter theory, the carbon being burned completely at the tuyeres and the carbonic oxide forming immediately thereafter. This process is, by the way, the one well recognized in making producer gas. Naturally any changes made in the temperature of the blast will affect the total heat of the furnace, but so far as the weight of air necessary to burn a given quantity of fuel is concerned it will remain the same, that is, 5.75 as much as there is carbon to be burned. This is provided the furnace is in proper working condition. The faster the air is forced into the furnace, the quicker the charges will descend, and vice versa. Since the same amount of heat developed in the furnace is required to produce a ton of iron right along, everything being equal, the only place to save fuel is in the blast, and that by heating it. This is done in the Cowper stove. These stoves consist essentially of four divisions; the combustion shaft, the dome acting as a combustion chamber, the checker work, and the smoke flue. The stove is alternately heated and cooled after the manner of a regular regenerative furnace. Thus with four stoves, three are always heated, the fourth giving off the stored heat to the blast. Each stove therefore is heated four and a half hours four times in the 24, and heats the blast four times for one and a half hours. The furnace gases are burned in these stoves for heating purposes, entering at the bottom through 6 ports. The air necessary for proper combustion is drawn in over the gas valve through adjustable openings, it goes up through 6 flues close to the combustion shaft, then down 7 other flues opening above the gas ports. In this way the air used is heated to about 550 degrees F., and thus promotes perfect combustion of the gases in the dome. The heat is now stored in the checker work and the cooled stack gases leave the stove through the smoke flue. It is important to obtain a perfect combustion of the gases in the combustion flue and dome, otherwise much available heat is lost. When the proper temperature is attained in the checker work, as shown by taking the temperature of the escaping products of combustion, the stove is reversed, all openings closed tightly to prevent the blast now turned in from escaping and thus causing loss and also danger from explosions by getting into the gas flue. The loss of heat in the blast during the one and half hour run is about 150 degrees F. In the particular case cited the average temperature of the blast was 1,670 degrees F., the end of the run being 1,560 degrees F. Some details of the stove construction are now given, among which may be noted the shape of the tile used for he checkerwork. This is a hollow cylinder, the outer surface of which is hexagonal, thus allowing close packing in the stove, the thinnest portion being one and a quarter inches. The griddle to carry the checkerwork is of tiles three and a half inches thick and two feet high, the whole structure being supported by brick piers and arches. The heating surface of the stove described and illustrated is 52,700 square feet, of which 48,400 goes to the checkerwork, which weighs 400 tons. To obviate any trouble likely to be caused by the fine lime and metallic oxide dust carried over by the blast furnace gases, most of which settled at the moment of combustion, the parts thus exposed must be of a material capable of resisting a basic attack. It is interesting to note that this stove, 23 feet in diameter and 82 feet high, exclusive of foundations, pipes, etc., cost $12,480 in the province of Lorraine, in Germany. Mr. Braune recommends five of these stoves for a blast furnace producing 150 tons of Thomas pig daily.

Turning now to the question of heating the blast, we find that the hotter the blast the less the coke used, and as a consequence the less air required. It is difficult to give figures covering general conditions, but Mr. Braune works out the special case he deals with. A few of the data are given herewith. Dry air blown into furnace, 7,920 lbs ; coke used, 2,246 lbs , containing 1 815 lbs. carbon Of this carbon 1 377 lbs. was converted to carbonic oxide in the bosh of the furnace, 80 lbs. went into the pig iron, and 1,735 lbs into the blast furnace gases The temperature of the blast at the stove was 1,600 degrees F.; at the tuyeres it was 1,475 degrees F. The temperature in the dome of the stove while heating was 2,000 degrees F. and that of the escaping products of combustion rods 675 degrees F. Mr. Braune now goes into the heat quantities, giving the necessary calculations based upon the specific heats of the component parts of the gases, etc., and deduces tables for the value of the various factors entering into the calculations, at temperatures varying from 32 degrees F. to 3,625 degrees F. For the detailed accounts of this work, the reader is referred to the article in question. The following, however, may be noted: Moisture and excessive amounts of air are the chief drawbacks to good combustion. The theoretical temperature of the burned gases in the dome of the stove is 2,900 degrees F., while the result obtained in the case cited was only 2,000 degrees F., which would indicate great moisture in the gases, or excessive air admitted. The latter can be regulated by observing the oxygen contents of the escaping products of combustion, while the former may be rectified by heating the air necessary for combustion of the furnace gases to as high a temperature as possible. An intimate mixture of these poor gases with the air is essential, furthermore the gases should be as clean as possible, and the lining of the stove be of a good quality. It is better to erect more stoves than to increase their size, thus allowing the shortening of the period of regeneration. This of course holds good only when the existing stoves are of an efficient type. For the conditions existing in Lorraine, Mr. Braune has fixed the maximum temperature of the blast at 1,750 degrees F., counting upon an efficiency of 70 per cent. This would require the use of all the gases produced, steam being raised by firing with coal. The resistance of the blast furnace lining would determine the question of using so high a blast temperature. Not only is a saving of coke effected by hot blast, but the chemical reactions are facilitated perceptibly. The experiments of Van Vloten have demonstrated that with hot blast under good pressure the carbon is burned to carbonic acid and then converted to carbonic oxide within a very small distance from the tuyeres. Thus within a radius of 25 inches from the tip of the tuyeres there existed nearly pure nitrogen and carbonic acid, barely a trace of free oxygen remaining there. This means a steadying tendency in the running of the furnace which should not be underestimated.

The existing practice of building blast furnaces higher than formerly in order to make use of the heat of the escaping gases is very natural. Where, however, the coke will not bear these greater weights, an equal advantage is gained by raising the temperature of the blast. The fears that with high blast temperatures the iron immediately in front of the tuyeres would burn and pass off into the slag have proved to be unfounded. On the contrary, the reducing atmosphere thus created with greater certainty protects the iron from burning or refining. A few points on the proper burning of the gases in the stove are given and the use of batteries of five of them to each blast furnace recommended.

THE Sargent Co., of Chicago, manufacturer of steel castings, reports last month to have been the largest in its history in the manufacture of steel castings. Among the work recently turned out was the partial completion of two Government contracts for steel castings. Included in one of these orders was a gun lever which showed a very high quality of steel when tested. The test resulted as follows: Tensile strength, 70,525 lbs.; elongation, 29.75 per cent; reduction of area, 44.5 per cent. This is considerably above the Government requirements, and is remarkable work, particularly for a so difficult casting as this was.

THE O. K. Cole Co. will occupy the harvester works at Winona, Minn., idle for several years, and will manufacture flour mill machinery. General foundry work will be done also.

Boiler Manufacturers' Convention.

The second day's session of the American Boiler Manufacturers' Association at St. Louis, Tuesday, Oct. 4, showed a number of additions to the list of attendants as printed last week. These included: R. D. Munroe, of Munroe & Son Pittsburg; A. C. Thompson, of Western Iron & Supply Co., St. Louis; John, Jas. J. and John A. Rohan, and Newton B. Stewart, of John Rohan & Son Boiler Works Co., St. Louis, D. A. Brislin, of the Brislin-Sheble Mfg. Co., St. Louis; W. H. Bryan, of Bryan & Humphrey, St. Louis; A. M. Castle, of A. M. Castle & Co., Chicago; J. W. Duntley, of Chicago Pneumatic Tool Co., Chicago; John D. Murphy of Chicago; E. M. Dickey, Iowa Iron Works, Dubuque, Iowa; Frank F. Corby, National Tube Works Co., St. Louis; I. C. Garstang E. R. Fish, David S. Everett, H. C. Meinholtz and Capt. R. J. Whiteledge, St. Louis.

The session of Tuesday morning was taken up largely with the report of the committee on

Uniform Boiler Specifications.

There was free and full discussion of certain sections of the report. In connection with the section relating to boiler tubes, Mr. O'Brien, of St. Louis, asked for an exchange of views on the merits of iron and steel tubes. He believed more steel tubes were now used than iron. President Hartley said that the United States Navy, as a matter of test, had put both iron and steel tubes in the Texas, an equal number of each. Col. Meier knew of a case in which charcoal iron tubes were being used alongside steel tubes, and thus far no difference could be seen. The service was very severe, too much so for steel tubes heretofore. In another instance he recalled, steel tubes had shown 40 per cent greater efficiency than iron.

Concerning the beading of tubes, it was stated that the section in the report was a compromise, 12 opposing beading while two favord it. A suggestion by Mr. Lappan that tubes be beaded on one end, that which was exposed to the fire, was endorsed by Col. Meier. This would compel the tube manufacturers to make tubes that could be beaded on either end. President Hartley noted that in marine service beading was not permitted. He told of a manufacturer who insisted that his boiler tubes should be loose, so that they might act as so many safety valves. Mr. Hartley said he realized that the beading of tubes at both ends was growing in public favor. The job looked better, and he favored such beading.

When Section 11, on removing old tubes, was reached, Mr. Garstang inquired if this matter came strictly within the bounds of a specification Col. Meier replied that, strictly speaking, it did not, but he thought the specification advisable. On the trans-Atlantic steamers, he was told that tubes were removed every three months.

The report of the committee was prefaced with a statement of its instructions, which were to follow the older official specifications in use in Europe and America, to eliminate provisions based on the mere guess-work of "authorities," and to embody those new rules which have become the unwritten law of the best American boiler shop practice, and which are found in the proceedings of the association. The specifications as recommended by the committee, with such slight amendments as were made after the discussion of Tuesday morning, are as follows:

MATERIALS. The materials for first class boiler work should be the standard materials as adopted at Philadelphia, by final vote recorded on page 77 of Proceedings of 1897, and as given in concise form on pages 207 and 208, Proceedings 1897. Other materials not therein specified are given in the body of these specifications in connection with provisions for the design and workmanship of the parts to which they apply.

RIVETING. Holes should be perfectly true and fair, made so by use of clean cutting punches or drills; sharp edges and burrs to be removed by slight countersinking and burr-reaming before and after the sheets are joined together. Under side of original head of rivet must be flat, square and smooth to insure perfect contact with the plate. For rivets from ⅝-inch to 13-16-inch diameter allow one and a half diameters for length of stock to form the head; for larger rivets allow less length. For button set on snap rivets five per cent (5) more stock may be allowed to form the driven head. Light regulation riveting hammers to be used until rivet is well upset in the hole; after that the snap and heavy mauls. For machine riveting more stock may be left for the driven head, to make it equal to the original head; this to be fixed by experiment. The amount of pressure on the die should be about 80 tons for 1⅛ or 1¼ inch rivets; 65 tons for 1-inch; 57 tons for 15-16 inch; 35 tons for ¾-inch rivets. Rivets should be tested both hot and cold by driving down on an anvil with the head in a die, by nicking and bending and by bending back on themselves, all without developing cracks or flaws. The heads of rivets to be of equal strength with the shanks; this is fulfilled by giving the head at the periphery of the shank a height equal to one-third the diameter of the shank. A slight fillet at this point is advisable. The rivets should have a diameter about double the thickness of the thinner plate; the pitch should be about three times the rivet hole; the distance between staggered rows of rivets half the pitch ; the lap for single riveting about equal to the pitch; the lap for double riveting about 1 1-3 times the pitch, and one-half pitchmore for each additional row of rivets. All these are approximations; the exact dimensions to be determined by making the resistance to shear of the total rivet strength of the net or standing metal.

A factor of safety of four and one-half shall be used where the tensile strength of the plate and the shearing strength of the rivets have been determined by actual tests; where this has not been done a factor of safety of five shall be taken, and at most 55,000 pounds t. s. per square inch for steel plate and 40,000 pounds shear strength per square inch for rivets be allowed. Rivet holes may be either punched with good sharp punches and well-fitting dies in American Boiler Manufacturers' Association steel up to five-eighths inch in thickness; above that thickness either punching and reaming with a fluted reamer, or drilling is advisable. The judicious use of the drift pin with light hammers in pulling the plates into place and rounding up the hole, is not objectionable; but englarging, or gouging holes to a fit by driving in a drift pin with heavy hammers or mauls is condemned as a barbarous practice. When drawn into an approximate fit the holes must be trued up by means of reamers.

CALKING. The old style, known as split calking, is unfit for boiler work. Excellent work can be done both by hand calking, or calking with pneumatic hammer and the Conery or round tool. Excessive calking throws undue strains on the rivet heads, and must be avoided. The square-nosed tool should be used only in corners where the round nosed cannot reach, and in taking up small local leaks, and extreme care is necessary to avoid nicking the lower plate. The fit should be made in the laying of the plates, the calking only to correct the natural and unavoidable roughness of the surfaces of contact. Calking edges should be prepared by bevel planing, bevel sh aring or bevel chipping.

FLAT SURFACES. The rules for flat surfaces have been experimentally determined, and should be amended from time to time in the light of tests of full-sized structures built up of the best modern materials and with the best modern tools and workmanship. The mathematical formulae for a plate supported on all sides have never been worked out to full satisfaction. The exact factor of safety under any empyrical rules cannot, therefore, be determined. The rules of the United States Board of Supervising Inspectors approximate a factor of safety of five. And as they have given satisfactory results during the past years, with materials of less excellence than American Boiler Manufacturers' Association stock, they are recommended as safe rules, viz :

State the thickness of plate in sixteenths of an inch, thus for ¼-inch plate, 8-16ths, or 8, thus: Assume a constant (C) for the following varying methods of construction:

C=112 for plates 7-16 inch thick and under, with screw stays, riveted ends.

C=120 for plates over 7-16 inch thick, with screw stays, riveted ends.

C=140 for all plates when in addition to the screw threads in the plates a nut is used both inside and outside of each plate.

Whenever salt, acids or alkali are contained in the feed water all plates must have nuts inside and outside, in addition to the screw threads in the plate. The safe working pressure per square inch can be expressed in the rule: Multiply the constant C by the square of the thickness of plate ex-

pressed in sixteenths of an inch, and divide by the square of the pitch expressed in inches. The quotient is the safe working pressure. The Supervisor's rules allow a still higher constant—C equals 200, based on large washers riveted as reinforcing plates on the outside of the plates. But this introduces the element of doubt as to weakening by rivet holes (which has caused abandonment of this method of reinforcing manholes) and it is therefore wiser to discard it.

Bumped or Dished Heads. Whenever a head is uniformly dished or bumped as a segment of a sphere, any radial section of same is under the same conditions of equilibrium as the circle seam of a cylinder, and as a circle seam has double the strength of a side seam (subject to percentage reduction due to riveting), it follows, that: The thickness of a convex or dished head should be the same as that of a cylinderical shell whose diameter is equal to the radius of curvature of the dished head. As this rule applies to a solid plate any reduction by rivet holes, manholes, etc., must be allowed for by proportionate increase in thickness.

Flanging, Bending and Forming. The exact heat for flanging, bending and forming cannot be fixed, but must be left largely to the judgment of the flanger, since it depends on various qualities of the steel, or iron, but under no circumstances should any blow be struck, or bending attempted after that portion of the plate undergoing manipulation no longer shows red in the dark. As the danger point is what is known as blue heat, this rule must be understood to apply to parts of the plate at least 4 inches distant from the point where the actual bending takes place or the blow is struck.

Rolling. All rolling should be done cold, and gradually by regular increments from the straight plate to the exact circle required, and care must be taken that the whole length of the plate is rolled to a true circle. If the lap for the rivet seam is left straight instead of being brought to this true circle, there is always a danger point on the line of demarkation.

Boiler Tubes. Boiler tubes should be made of charcoal iron or mild steel specially made for that purpose, and should be lap-welded or drawn.

They should be round, straight, free from scales, blisters and mechanical defects, and each tube subjected to an internal hydrostatic pressure of 500 pounds to the square inch, and so stencilled. The manufacturers' name should also be plainly stencilled on each tube. The metal thickness should be as follows, but may be increased when demanded by specially high pressure or extreme lengths:

1-inch, 1¼-inch, 1½-inch and 1¾-inch—No. 13 Birmingham wire gauge.

2-inch, 2¼-inch and 2½-inch—No. 12 Birmingham wire gauge.

2¾-inch, 3-inch, 3¼-inch and 3½-inch—No. 11 Birmingham wire gauge.

3¾-inch and 4-inch,—No. 10 Birmingham wire gauge.

4½-inch and 5-inch—No. 9 Birmingham wire gauge.

Tests. A section cut from one tube taken at random from a lot of 150 or less, must stand hammering down vertically without cracking or splitting when down solid.

For 1-inch, 1¼, 1½ and 1¾-inch tubes, length of test section, ¾-inch.

For 2-inch, 2¼ and 2½-inch, length of test section, 1 inch.

For 2¾-inch, 3-inch and 3¼-inch, length of test section, 1¼ inch.

For 3½-inch, 3¾ and 4-inch, length of test section test 1½-inch.

For 4½ and 5-inch, length of test section, 1¾-inch.

All tubes should stand expanding flange over on tube plate, and bending without flaw, crack or opening of the weld.

Tube Holes. If punched, should not be full size, but allow not less than ⅛ inch on the diameter for reaming. Tube sheet should be annealed after punching, and before reaming. All holes should be slightly countersunk on both sides, to prevent cutting tube by expanding and beading. If copper ferrules are used, the hole should be a neat fit for the ferrule. If ferrules are not used, the hole should be 1-64th to 1-16th of an inch larger, according to size of tube.

Tube Setting. Ends of tubes should be annealed in the tube mill before setting. The tube should be allowed to extend through tube sheet 1-16th inch for every inch of diameter, which is ample for beading, then expanded until it is tight in the hole and no more; excessive expanding should be guarded against. On the end exposed to direct flame, flange tube partly over on sheet, allowing part of the right angle flange or bead to be completed by beading tool. The beading tool should not come in contact with the tube sheet, but work entirely on the tube; after beading, tube should be slightly expanded to counteract the loosening effect of the beading process.

Copper Ferrules. Copper ferrules should be used in fire tube boilers on the ends subject to direct heat; they protect the flue holes; protect the flues from crystallisation on account of expanding. Make better and surer joints on account of softer metal being compressed between the two harder ones. The tubes are more readily removed on account of tube holes being larger, and when scaled, scale and sediment is removed with them; while when body of tube fits the hole, it scrapes all scale and sediment off and leaves it on the inside of the boiler. Ferrules should be from 18 to 14 wire gauge, according to size of tube.

Removing Old Tubes. This depends largely on circumstances. There is always one end of the boiler where the tube is more readily removed than the other. Sometimes it is convenient to drop them down and take them through a man or hand hole, then again raise them to a dry pipe hole, or take them through the hole they have been occupying. In any event, first remove the beading with a flat chisel. Be very careful not to injure the flue sheet, then cape in past inside of flue sheet with a chisel or round back diamond point. Have sharp corners removed from tool to avoid cutting or scoring edge of flue hole. Then cave end of tube inward. The tube is then ready for removing from boiler, as circumstances may suggest. Where the tubes have not been beaded over they can be readily loosened for removing by using a crimping tool made with two fingers of unequal length between which the metal of the tube fits easily, the longer finger inside the tube forms a fulcrum, the shorter one outside crimps the metal inwards.

Riveted and Lap Welded Flues. There are so many variations in details of construction involved in the question of the strength of such flues that a mathematical determination of their strength, which must necessarily depend on certain assumptions, is not practical. On the other hand, experimental work in testing flues of this character is necessarily very expensive, and would have to cover so large an amount of ground that no private firm or corporation could undertake it, and the determination should be left to Governmental testing works. Your committee, therefore, deems it best for the present, and until other experimental data are available, to adopt in full Sections 8 to 13 inclusive, of Rule 11, of the Board of Supervising Inspectors of Steam Vessels.

Corrugated Furnace Flues and Steam Chimneys. The same remarks as made regarding flues apply to corrugated furnace flues and steam chimneys, and your committee, therefore, recommend the adoption, for the present, subject to amendment on the basis of further experimental data, the provisions of Sections 14 and 15 of Rule 11, of the Board o Supervising Inspectors of Steam Vessels.

Stay Bolts. Should be made of iron or mild steel specially manufactured for the purpose. If made of iron, the material should have a tensile strength of not less than 46,000 pounds, and not less than 26,000 pounds elastic limit. Elongation not less than 22 per cent in eight inches for bolts of less than one square inch net area, nor less than 20 per cent in eight inches for bolts of one square inch and more in net area. If made of steel, the material should have a tensile strength of not less than 55,000 pounds, and not less than 33,000 pounds elastic limit. Elongation not less than 25 per cent in eight inches, for bolts of less than one square inch net area, nor less than 22 per cent in eight inches for bolts of one square inch and more in net area. Stay bolts should be subjected to the following tests:

1. A bar to be selected at random from a lot of 1,000 pounds or a fraction thereof. After being threaded with a sharp die, "V" thread with rounded edges, it should bend cold 180 degrees around a bar of the same diameter without showing any crack or flaw.

2. Another piece similarly threaded to be screwed into well fitting nuts formed of pieces of the plates to be stayed

and riveted over so as to form an exact duplicate of the bolt in the finished structure. It is then to be pulled in a testing machine, and the ultimate stress carefully noted. If it fails by pulling apart the tensile stress per square inch figured on the original net section is to be used in figuring the safe load. If it fails by shearing the shear stress per square inch of the mean section in shear is to be thus used. This mean section in shear is found by multiplying half the thickness of the plate or nut by the mean between circumferences at base and at crown of thread. The safe load to be determined by applying a factor of safety of five to the ultimate stress per square inch thus found.

Stay bolts should be carefully threaded with sharp, clean dies; they should be cut on a threading machine equipped with a lead screw, so that there will be no variation in the pitch of the stay bolt threads. Holes should be tapped with tap extending through both sheets, and to a neat, smooth fit, just large enough that the bolt can be put in by hand lever or wrench with a steady pull. Great care should be taken to make full, clean V-threads, rounded edges, making a close, neat fit, so that very little riveting will be required. One-fifth of diameter is proper height for projecting and riveting. Riveting is detrimental to threads in sheet and on stay bolts. In the case of hollow stay bolts, a long, slender drift pin should be driven into the bore before and kept there during riveting and afterwards driven home firmly to slightly expand the bolt and counteract the tendency to loosen the thread due to the riveting, and finally removed by loosening it by slight taps of the hammer all around, or by driving out by a bar from the other end. When nuts are used on screw-stays, the height or thickness of such a nut shall not be less than 60 per cent of the diameter of the bolt. The largest pitch permissible for screw-stays is 10 inches.

Braces and Stays. The material in braces and stays should be fully equal to stay bolt stock. A bar not less than 10 inches long shall be taken from each lot of 1,000 pounds or fraction thereof, and tested to destruction; the tensile strength thus found, subject to a factor of safety of five, shall limit the tensile stress per square inch permitted on the brace in direct pull. Where such tests are not made the material shall be subject to careful inspection, and if it appears satisfactory, 6,500 pounds per square inch for wrought iron and 8,000 pounds per square inch for steel shall be the highest loads permitted. Welding should be avoided where possible, and where welds have to be used they are to be considered as having only 80 per cent of the strength of the solid bar. Rivets by which braces are attached to the boiler when the pull on them is other than at right angles, should be subjected to only half the stress permitted rivets in the seams.

Manholes. The older methods of reinforcing manholes have been found by practical tests to be defective. A ring or plate riveted on inside or outside never becomes a part of the original plate, and there are many instances where the main plate was fractured under test, while the reinforce plate or ring was as good as new. This shows that it is not possible to make the reinforce plate relieve the main plate of the portion of the load intended. This becomes worse when the metal of the reinforce plate is different in quality from that of the main plate. Besides this the rivet holes necessary for joining plate and ring together introduce a new element of weakness and uncertainty. Cast iron reinforce flanges are of no value whatever and are unqualifiedly condemned. The best method of forming a manhole is to cut the hole considerably smaller than required, and then flange it in with a straight flange on a radius not less than three times the thickness of the metal. In place of attempting to rivet on a piece of plate to make up for that cut away, it is better to make the original plate that much thicker. Or, the flange may be reinforced by shrinking on a reinforce ring around it, and this should always be done where the plate is one-half inch or less in thickness.

Domes. Domes should be avoided when possible. No method of reinforcing the shell where the hole is cut for the dome gives absolute security. But where domes cannot be avoided, the cylindrical portion of the dome should be flanged down to the shell of the boiler and the shell either flanged up inside of the dome or reinforced by a collar flanged at the joint, and these flanges should be double riveted.

Drums. Drums may be put on with collar flanges of A. B. M. A. steel, not less than three-eighths inch thick, double riveted to the shell and the drum, and single riveted to the neck or leg, or the flanges may be found on the legs.

Saddles or Nozzles. Should be of flanged steel plate, or of soft cast steel. The latter, however, has the disadvantage that it is frequently porous, and has not the same ductility as the shell plate, and cannot be held to be as good as flanged A. B. M. A. plate. Cast iron must not be used for any opening in which it will be in tension.

Hanging. The boiler should be supported wherever practicable, at the points where there is the greatest excess of strength. Excessive local stresses from the weight of the boiler and contents should be avoided, and therefore short lugs are objectionable. Any straps or lugs from which the boiler is suspended should be made very long on the shell, so as to insure against distortion of any kind, and the rivets for securing them to the structure should be so proportioned as to take only one-half of the stress which is permitted for rivets in the seams. The boiler should be set in such a manner that the furnace may be rebuilt without in any way disturbing the proper suspension of the boiler. All boilers should be so set that there will be a little less water at the gauge cocks than at the opposite end of the boiler.

Hydrostatic Pressure. The old methods of testing by excessive hydrostatic pressure are condemned as barbarous and tending to weaken the structure and disturb the proper fit of the parts. The hydrostatic test should never be used to take the place of a proper and thorough examination of the quality of materials, proportions and workmanship of the boiler. The hydrostatic test should never exceed a pressure of one third above the regular working pressure, and under no circumstances should this excess be more than 100 pounds per square inch; the water used for hydrostatic test should never be less than 125 degrees Fahr. in temperature.

In conclusion the committee says that while it is far from believing that the above specifications are the best that can be written to-day, it knows that they represent the average opinion of members who have been most active in the affairs of the association.

Business Sessions.

At the business sessions of the convention apart from the time devoted to the specifications a number of matters of detail were attended to. The committee on next place of meeting, consisting of Messrs. Borger, of Columbus, O'Brien, of St. Louis, and Smith, of Charleston, S. C., reported in favor of Cleveland, and the last week of July was selected as the time, subject to change at the request of the local committee.

Col. Meier made a statement, which all present heard with regret, announcing that after nearly nine years in the office of secretary, his business interests and the necessity of doing not a little traveling, made it imperative that he resign. Tribute to Col. Meier's faithfulness, his unfailing courtesy and devotion to the association was paid by several members, and a minute was adopted unanimously recognizing his long service, regretting his retirement and thanking him for his efficient and conscientious service.

The committee on nomination reported the following, who were elected: President, Henry J. Hartley, of Philadelphia; secretary, J. D. Farasey, Cleveland; treasurer, Richard Hammond, Buffalo; first vice-president, Daniel Connelly, Cleveland; second vice-president, John O'Brien, St. Louis; third vice-president, R. Munroe, Jr., Pittsburg. The committee recommended increasing the number of vice-presidents to five, presenting for fourth and fifth places, Wm. McGregor, of Chicago, and J. Don Smith, of Charleston, S. C. The change will be submitted to letter ballot of the membership.

A letter was read from Chief Engineer Melville, of the United States Navy, and one from the Pennsylvania Railroad, on "Stay Bolts." The latter went into the subject at length. It was ordered printed for distribution.

Thursday morning's business session was adjourned to the John O'Brien Boiler Works, where a hydrostatic boiler rupturing test was conducted by Wm. W. Corey, United States boiler inspector at St. Louis. His report will be incorporated in the proceedings of the association.

Protective Features Desired.

An executive session was held on Wednesday to consider

the report of the Committee on the Betterment of Business Conditions. In his opening address President Hartley referred to the protective feature advocated by Ex-President Lappan at the last convention. Mr. Hartley believed that if the association could be made protective on a basis similar to that of the master plumbers' and other associations, and all manufacturers induced to become members, there would be less cutting of prices and better remuneration for labor. He recommended that the matter be seriously considered by the association and that it be a regular topic at the annual meetings until some results were obtained. That the American Boiler Manufacturers' Association is not absolutely protective, as well as a power in the trade, is solely attributable, he thought, to the indifference of its members.

The discussion of this subject at a later session of the convention showed a strong sentiment in favor of a closer union. Mr. Lappan said the condition of prices was such, owing to cutting by irresponsible outsiders, as well as among the boiler manufacturers themselves, as to demand some remedial measure. He explained that parties without any capital or shops of their own were among the greatest disturbers in the business. The rolling mills, too, were too much inclined to sell material to any one who wanted it. He thought that if they intended to exercise this privilege, they should at least in all fairness make legitimate boiler makers lower prices than were offered to outside trade.

President Hartley said that he had received a number of letters from boiler manufacturers who promised to go into the association if it could be made strongly protective. He was not prepared to throw out any definite suggestions as to how the association could be made protective in the fullest sense of the word, but he was certain of one thing, that this is an object very much to be desired.

Col. Meier said that the matter brought up by the committee was one of the primal objects for which the association was organized. It involved a question which has troubled the executive committee at every association meeting. He then reviewed the matter at length in its several bearings, and the advances which the association had been able to make towards securing a standard for material, uniform boiler inspection laws and other matters revolving around the central question—the good of the organization.

The discussion in executive session on Thursday will doubtless be heard from further in an effort during the coming year to extend the tangible benefits of the association and widen the circle of its membership.

Notes.

Geo. M. Riley, the representative of the National Tube Works, of McKeesport, Pa., made himself known through the medium of a very handsome pocket cigar cutter, which he distributed among the delegates. A cigar went with each cutter.

Col. E. D. Meier, of the Heine Safety Boiler Co., St. Louis, is an ideal secretary. He knew every one, and it was largely through his genial personality that the visitors were made to feel at home. It was with deep regret that his decision to retire from the secretaryship, after nine years incumbency, was yielded to by the association.

The local entertainment committee, consisting of Joseph Wangler, Andrew Thomson, J. A. Wangler, Frank Palmer and I. C. Garstang, were diligent in the discharge of their office, and provided the best of good times for every spare moment.

Henry J. Hartley, of William Cramp & Son's Ship & Engine Building Co., Philadelphia, was an excellent presiding officer. He is of dignified presence, and kept the convention well in hand at all times.

On Tuesday afternoon many of the delegates were taken to visit the St. Louis water works, while others took occasion to see different parts of the city. In the evening the visitors were given seats to view the parade of the Veiled Prophet, and were invited to attend the ball.

The Juragua Iron Co., of Santiago de Cuba, shipped a cargo of iron ore to the Maryland Steel Co., Baltimore, Md., last week. This is the first shipment of iron ore from Cuba since the war.

PERSONAL.

W. D. Sargent, of the Sargent Co., Chicago, has returned from a very successful business trip in Europe, taken in the interests of the International Brake Shoe Co. Mr. Sargent has made arrangements for the sale of the International company's products in nearly every foreign country. He reports a growing desire on the part of foreign concerns to take up American goods, and that any article of American manufacture which possesses merit will find a ready sale abroad. He is taking figures at present from American pipe manufacturers, for an English correspondent, on 32,250 tons of water pipe of various sizes, and hopes to be able to place the business in this country. The pipe is for London or Liverpool delivery.

E. L. Ford, of the Youngstown Steel Co., has just returned from a European trip.

Chas. Davis has disposed of his interest in the American Tool Works Co., Cincinnati, of which he has been president. His continued illness has led to this decision.

E. A. Saunders, president of the Richmond (Va.) Standard Iron & Spike Co., died Oct. 2.

F. F. Whittekin, technical director and chief engineer of the Government railroads of the United States of Colombia, has been in Pittsburg recently to place contracts for about $250,000 worth of railroad material for a line being built from Port Barrios to Medellin, in the center of the gold quartz district.

Henry R. Wolcott, candidate for governor of Colorado, on the Administration Republican ticket, is first vice-president of the Colorado Fuel & Iron Co.

C. L. Lingo, formerly with J. W. Ellsworth & Co., of Chicago, has taken the management of the coke department in the Chicago office of Rogers, Brown & Co. Mr. Lingo, who is an experienced coke man and well acquainted with the trade, will undoubtedly be able to handle the large coke business of this firm with credit to himself and to the satisfaction of his customers.

Simon Obermayer, the founder of the S. Obermayer Co., of Cincinnati and Chicago, died at Cincinnati, Sept. 23. As a pioneer in the business of supplying foundry needs, Mr. Obermayer came in contact with representative men in the trade in all parts of the country, and always held their respect and esteem.

Gen. James L. Botsford, of Youngstown, whose serious illness was noted in a recent issue, died on Oct. 6. He belonged to President McKinley's regiment in the civil war, and received an appointment as inspector of volunteers in the Cuban war, but was unable to serve. For many years previous to 1896 he was vice-president of the Mahoning Valley Iron Co. The Legion of Honor and the Grand Army of the Republic had part in the funeral services.

T. T. Wood has resigned as manager of the Lakeside Malleable Iron Works, of Racine, Wis.

Shenango Valley Bessemer Steel Plant.

TO THE EDITOR:

I ask space for the following in your valuable paper, as it may be the means of directing the promoters of a new Bessemer steel plant in the valleys to a most desirable location. Across the river from the Mabel, Douglas, Spearman and Sharpsville furnaces at Sharpsville, Pa., and a very short distance from the Alice and Claire furnaces, lies a tract of from 20 to 40 acres of as finely situated land, with advantageous surroundings, as could be desired for as teel plant. The plant could be located 20 to 30 feet above the level of the river, out of all possible danger of high water or flood. A tract of from 15 to 20 acres adjoins this site, which would afford dumping ground for 50 years or more, should the company desire at any time to erect additional furnaces in connection with the steel works. This land may be purchased very cheaply in tracts from 10 to 40 acres. The Erie and Pennsylvania Railroads can be readily tracked to reach the works, or switches built to convey direct metal from any or all of the six furnaces. The transportation of hot metal from the farthest furnace need not take more than five minutes. There are other advantages that might be mentioned, but the single consideration of convenience in handling direct metal should commend the site to parties advocating the project.

PIG IRON.

The economy or capacity of boilers depends on two things —the temperature of the water supplied to them, and the absence of scale or incrustations from their heating surfaces. With the Cochrane Heater and a supply of exhaust steam the feed water passing to the pumps will have a temperature of over 200°—say from 208° to 210°—and moreover, these high temperatures will be given so long as the supply of steam is passed into the Heater, even though scale forms three inches thick on the sides of and on the trays within the Heater. All scale forming matter which remains or becomes insoluble at the temperature of exhaust steam can be prevented from locating on and adhering to the interior surfaces of boilers if the opportunity is accorded them to settle and deposit on other surfaces—precipitation and settlement occur in Cochrane Heaters, and these appliances are so made that it is an exceedingly easy matter to clean them. Think of thirty minutes for the operation of cleaning a "Cochrane" as against hours and days for the removal of the same quantity and quality of scale from your boilers, or from a closed heater! The Cochrane Heaters also save all of the exhaust condensed in heating the water, and this addition to the supply is nothing more or less than distilled water—perfectly pure. Practically no such thing as repairs to Cochrane Heaters, and no leakage troubles. Well made, practical Heaters. The Harrison Safety Boiler Works, of Philadelphia, Pa., will be pleased to furnish illustrated catalogues on application, or to submit detailed specifications and estimates on receipt of particulars of requirements.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The American Iron & Steel Co., principal office No. 60 Grand st., Jersey City, N. J., has been incorporated for mining, manufacturing, building, etc. Capital, $1,000,000 Incorporators: William Fillingham, Kenneth K. McLaren and Henry W. Meen, of No. 60 Grand st., Jersey City, N J.

Articles of incorporation have been filed by the Eagle Iron Works, of Brooklyn, N. Y. It is proposed to conduct the business of architectural, ornamental and structural iron work and to deal in building materials, etc. The capital stock is $25,000. Directors for the first year are Jacob May, Charles H. May and Antine May, of Brooklyn.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., is receiving estimates on an open-hearth plant for steel castings.

New Construction:—

The Toledo Machine & Tool Co., it is said, will build its new plant in the suburb of Auburndale.

The Keystone Bridge Works, of Pittsburg, will soon begin shipping the material for the main building of the new steel plant at Ensley, Ala.

The Berlin Iron Bridge Co., East Berlin, Conn., is furnishing for the Laflin & Rand Powder Co., Pompton, N. J., the steel roof for one of its store houses. The building is 45 feet wide and 150 feet long. The roof trusses are of steel, and the roof is corrugated iron supported on steel purlins.

The McCormick Mfg. Co., successors to the Des Moines Fence Co., DesMoines, Ia., has been organized with $25,000 capital. J. L. Carey, is president. The company is erecting a large factory.

Riter-Conley Mfg. Co., of Pittsburg, has been awarded the contract for building the new plant of the Latrobe Steel Co., at Melrose Park, Ill. The contract involves $50,000 and was won for Pittsburg after keen competition from Western firms.

J. J. Markey, president of the National Wrought Iron Annealing Box Co., of Anderson, Ind., has concluded arrangements to erect a plant at New Castle, Pa., for the manufacture of annealing boxes for tin plate factories. The work on the new plant will be started at once and about 50 hands will be employed.

Additions, Enlargements, Removals, Etc.:—

The Peru Plow & Implement Co. will enlarge its plant at Sioux Falls, S. D.

A new steel building and other extensions are being added to the Pennsylvania Car Wheel Co.'s plant, at Pittsburg. Wm. B. Scaife & Sons, of Pittsburg, have the contract.

The Port Huron (Mich.) Engine & Thresher Works Co. contemplates improvemens to its works and two new buildings will be erected in the coming year

The Jackson & Sharp Co., Wilmington, Del., is building an addition 60 feet long, adjoining its draughting room.

The International Heater Co., of Utica, N. Y., is making extensions in its manufacturing department

Ground has been broken for a large addition to the Carpenter Steel Works, Reading, Pa.

The D. E. Whiton Machine Co., Stafford, Mass., has enlarged its works.

Keck, Gonnerman & Co., Mt. Vernon, Ind., are erecting a brick addition to their new foundry, 40x60 feet. A new 60 h. p. Corliss engine, a new boiler, besides several new machine tools, have also been added to the plant.

The Watts Steel & Iron Syndicate, Middlesborough, Ky., is making a large addition to its plant, consisting of a 22-inch mill to roll steel down to bars or steel rails. The building of a 10-inch mill is also being considered. The work is being done by the Middlesborough Foundry & Machine Co

The Sterlingworth Railway Supply Co., of Easton, Pa., will build an addition 200x400 feet to its plant in West Easton.

The Shenango Machine Co., Sharon, Pa., will enlarge its plant.

The Aschman Steel Casting Co., of Shearon, Pa., is looking for a new location for a steel foundry. It is the expectation to employ from 200 to 250 men. The company desires a location a little nearer Pittsburg than it now has.

The Q & C

Shop Saws

Cut Everything. - - - -

No. 1. Capacity, 4 inches.
No. 2. " 5 "
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POWER SAWING MACHINES

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OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

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Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

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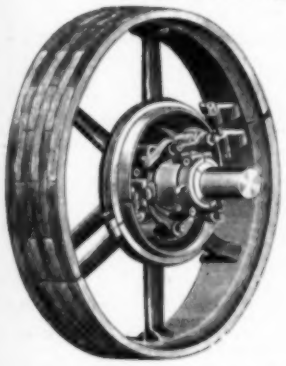

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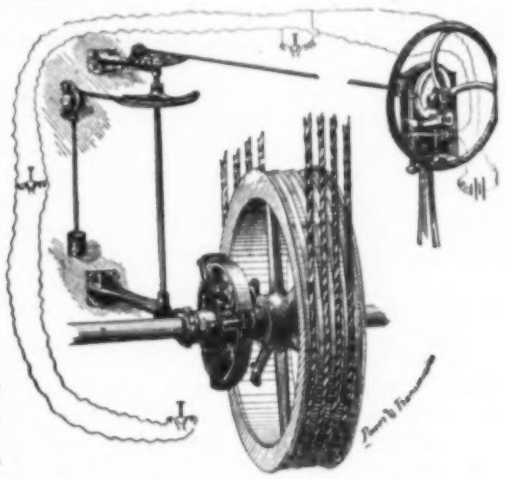

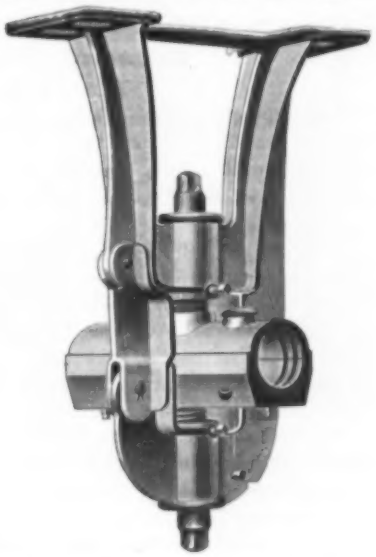

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GENERAL AGENTS FOR THE DODGE INDEPENDENCE WOOD SPLIT PULLEYS.

Fires and Accidents:—

The Hassell Iron Works, Colorado Springs, Col., had an $8,000 fire.

Fire caused a loss of $10,000 to the foundry of Williams, White & Co., at Moline, Ill.

At the Anderson, Ind., plant of the American Steel & Wire Co., the blowing out of a cylinder head of the rod mill engine will cause a three weeks' shut down.

Fire at Rochester, N. Y., caused a loss of $3,000 on patterns and machinery at the machine shop of Walter Morrison.

At Luzerne, Pa., fire destroyed the Luzerne Mfg. Co.'s machine shop with part of contents.

Morrison's machine shop, Boston, Mass., was destroyed by fire Oct. 1. The estimated loss on building and machinery is $8,000, with insurance of $3,200. The heaviest loss is in patterns for castings, of which there were $3,000 worth that cannot be duplicated.

General Industrial Notes:—

The Shultz Belting Co., St. Louis, Mo., has been doing a very large business lately, both domestic and foreign, and reports the outlook for future business never to have been better than at present.

It is reported that the Irondale Furnace at Independence, W. Va., will yet be sold at $12,000, the figure bid for the furnace and 1,300 acres of mineral land, when the property

U. BAIRD MACHINERY CO.,

123-125 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

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By **Foundry Manager, Secretary, Salesman** or **Sales Manager.**, by a young man thoroughly experienced in the foundry business. Well up in all modern foundry practice, mixing of metals, cost of castings, etc. Can furnish best of references as to ability, hustling qualities, character, etc. Address

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1-32 to 1-2 inch in diameter—any gauge.

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PUNCHES AND SHEARS

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MANUFACTURED BY

The Long & Allstatter Co.,

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Send for catalogue.

SHENANGO VALLEY STEEL CO., New Castle, Pa.,

MANUFACTURERS OF

Bessemer Pig Iron, Steel Billets, Blooms, Black Plate, Tin Plate, Tin Plate Bars, Wire Rods, Market Wire and Wire Nails.

was put up for sale by order of the court. Cincinnati parties are said to have bid $25,000 since, but have not yet made the cash payment.

Clement W. Broderick, of Hartford, Conn., who has a contract for making 100,000 6-pound shells for the use of the Navy, has leased the buildings at Windsor recently occupied by the Spencer Automatic Machine Screw Co., and will execute his contract in that town.

The Adirondack Machine Co.'s plant, at Carthage, N. Y., has been leased to the Stiles Mfg. Co., of Watertown, N. Y.

At Salmon Falls, N. H., the stove foundry of the Somersworth Machine Co. shut down last week owing to the failure of the Sawyer Woolen Co., at Dover, N. H., which was the chief owner.

A contract for pulleys, braces and steel structural framework has been awarded Jones & Laughlins, Ltd, by the Laurentide Pulp Co of Grand Mere, Que., the largest pulp manufactory in British North America.

The holding of President Chas. Davis in the American Tool Works Co. has been purchased within the past week. A new board of directors has been elected, consisting of A. B. Voorheis, Franklin Alter, Thomas P. Egan, Robert Laidlaw and B. B. Quillen. Messrs. Voorheis and Alter take the places of Charles Davis, who is incapacitated by illness, and Henry Luers, the first of whom resigns as director and president, and the latter as director and secretary. B. B. Quillien will remain in the office of manager, and there will be an executive committee of two who will act in direct control of the affairs of the company. The $500,000 of the common stock of the company has all been taken and it was decided last week to issue $200,000 of the authorized amount of $500,000 of the preferred stock, which was at once taken by three of the directors.

The Olds Gasoline Engine Co. has purchased the Motor Vehicle Co.'s plant, at Lansing, Mich., and in addition to gasoline engines will manufacture on an extensive scale, the Olds horseless carriages. The capital stock has been increased from $50,000 to $150,000.

The Playford Stoker Co., Cleveland, has been awarded a contract for six 250-h. p. automatic stokers by the Apollo Iron & Steel Co., Vandergrift, Pa.

The National Tube Works Co., McKeesport, Pa, has contracted to furnish about 35 miles of pipe to the Kentucky Oil & Pipe Line Co., for its new line from Slick Ford to Somerset, Ky.

Preliminary steps have been taken looking to the reorganization of the Ohio Iron Co., at Zanesville, O., and the adding of modern equipment to the plant. The works have been idle for some time.

The entire plant of the Ellis & Lessig Steel & Iron Co., at Pottstown, Pa., is in full operation and the concern has a very large number of orders on hand. At present it is operating 22 double puddling furnaces.

A new machine tool building establishment has been opened at Ridge ave. and Hamilton st., Philadelphia, by Lucas & Gliem, mechanical and electrical engineers. The firm are builders of belt and electric driven milling machines, slotting machines, cold saw cutting off machines, boring machines and special machines of all kinds. They have a good deal of work in hand already.

Ashland Furnace No. 1, at Ashland, Ky., was blown in Oct. 1, making the third furnace of the group now in blast.

The Talbott Machine Works, Richmond, Va., have been leased to a company which will do the work on the torpedo boats recently let to W. R. Trigg, of Baltimore.

A machine shop will be operated by the Shenango Valley Steel Co., New Castle, Pa., in connection with its extensive plants.

LATEST AND BEST

Patent No. 580,205.

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The Brass Founders' Supply Co. are the only makers of Patented Ribbed Flasks like cut. All others are infringements. We license no others to make a ribbed Flask. Our Flasks are milled true. Hundreds of foundrymen will testify that it is the best Flask they have ever used.

QUALITY MAINTAINED and PRICE REDUCED.

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ALL FOUNDRY SUPPLIES AND CASTINGS, TOO.

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☞If you want fine Grey Iron Castings, send sample for estimates.—B. F. S. Co.

The Brier Hill Iron & Coal Co., Youngstown, O., has its new plant for the manufacture of cement from furnace slag about ready for operation.

The Pennsylvania Steel Co. broke its record for steel production with an output of 1,600 tons of blooms, on Sept. 29. On the same day the rail mill turned out 878 tons.

At Birmingham, Ala., the Alabama Steel & Ship Building Co. filed a first mortgage and deed of trust to the Manhattan Trust Co , of New York. The mortgage is for $1,100,000, and provides for an issue of bonds to run 30 years at six per cent. The deed of trust states that the mortgagor has issued $50,000 of common stock, and $410,000 of preferred stock, making a total capital of $460,000. The company has completed all financial arrangements to float its bonds, and has let contracts for the construction.

At Watertown, N. Y., the New York Air Brake Co.'s new foundry started up last week.

The Lebanon (Pa.) Boiler, Foundry & Machine Co., has made an assignment. The company's liabilities are $22,000 and its paid up capital $50,000.

At Ashland, Ky., 15 of the 30 coke ovens now building are about to be started on local coal.

The Burley Heater Co., Tyrone, Pa., made the first cast in its new foundry last week.

At Spokane, Wash., the Union Iron Works and the Reid Machine Co. have consolidated and general foundry and machine shop work will be done under the name of Reid Union Iron Works.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, manufacturer of engines, tin plate and rolling mill machinery, recently received a contract from the Watts Steel & Iron Syndicate of Middlesborough, Ky., for a large hydraulic shear of sufficient capacity to cut 10x16-inch steel slabs.

The incorporation of the F. B. Shuster Co., of New Haven, Conn., is announced under date of Oct. 3. The capital stock is $40,000 in 800 shares. The incorporators are Franklin B. Shuster, president and treasurer; Luella F. Shuster; Geo. D. Phillips, vice-president; F. L. Kutscher, secretary, and Edward F. Edgecombe, general superintendent.

Iroquois Furnace, South Chicago, which has been out of blast undergoing repairs for some time past, is expected to blow in about Oct. 18.

The Old Meadow Rolling Mill Co.'s new sheet mill at Scottdale, which has been put in operation at last, contains six sheet furnaces, six pair furnaces, five annealing furnaces, one 26x54 inch mill, one 24x44-inch mill with roughing rolls, and two cold mills. The plant has an annual capacity of about 12,000 tons.

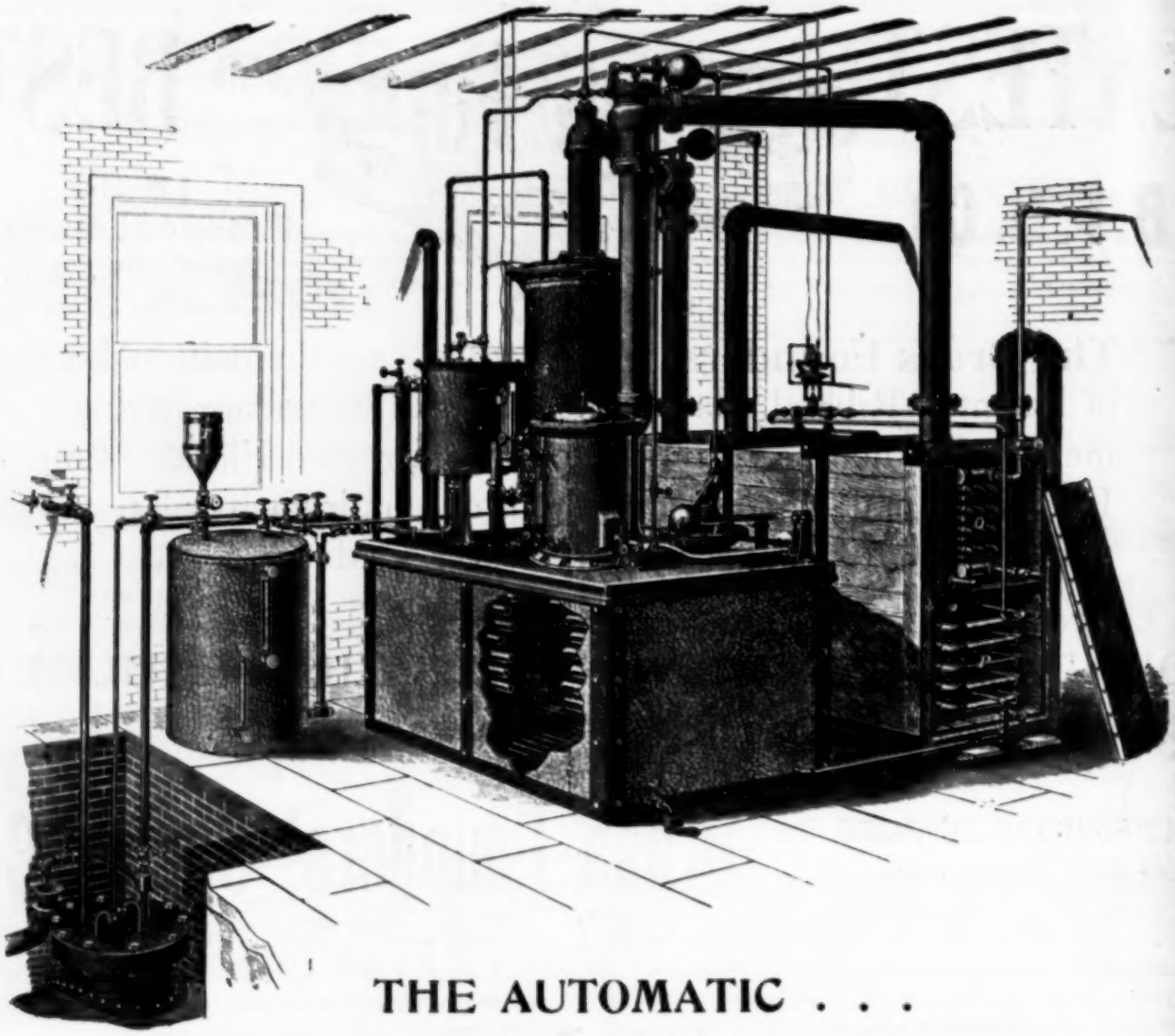
Within a short time the entire switch and signal manufacturing business will be controlled in Pittsburg. Negotiations for the purchase of the National Signal Co., at Easton, by the Union Switch & Signal Co., have been practically concluded. A meeting of the stockholders of the Union company has been called for Dec. 13 to ratify the deal. At the same time a vote will be taken on a proposition to issue five per cent bonds to the amount of $500,000.

It has rarely happened that the steel industry of Great Britain has been so fully occupied as it is at the present time. In Scotland, most of the works, new and old, are making substantial additions to their plants. These include a very fine range of 10 40-ton furnaces at the Blochairn works of the Steel Co. of Scotland, and a specially large plate mill at the works of the Lanarkshire Steel Co., which is believed to be the most powerful in the world. The new mill has been built by Messrs. A. Lamberton & Co., of Coatbridge, who have also produced a lot of exceptionally powerful plants for the Weardale, the Cyfarthfa, and other works.—London Iron and Coal Trades Review.

LOW RATES TO OMAHA.

Every Day via Pennsylvania Lines for Trans-Mississippi Exposition.

Excursion tickets to Omaha are on sale daily at principal ticket offices of the Pennsylvania Lines and may be obtained up to October 15, inclusive. The return limit includes November 15. For special information about the low fare and quick through time over this route, apply to nearest ticket agent of the Pennsylvania Lines, or address C. L. Kimball, Asst. Gen. Pass. Agent, 149 Superior st , Cleveland, O.



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